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J. Platteau 1874-1875

July 23







VITA  
Chicago  
1912



*Compliments of*

**W. H. CLARKE,**  
Assistant City Engineer, in charge of Sewerage.



CHICAGO WEST SIDE  
WATER WORKS



FIRST ANNUAL REPORT  
OF THE  
DEPARTMENT  
OF  
PUBLIC WORKS,

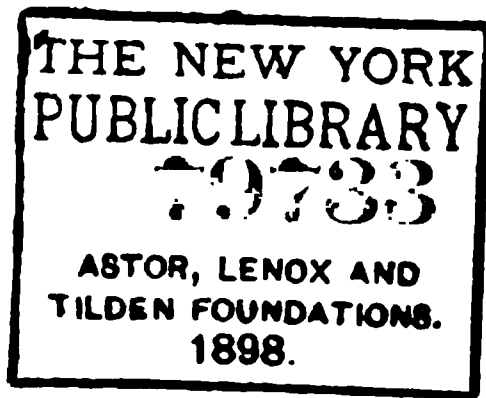
TO THE  
City Council of the City of Chicago,

FOR THE FISCAL YEAR ENDING  
DECEMBER 31, 1876.



CHICAGO:  
CLARK & EDWARDS, PRINTERS, 162 AND 164 CLARK STREET.  
1877.





# DEPARTMENT OF PUBLIC WORKS.

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## OFFICERS:

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MONROE HEATH, MAYOR.

D. S. MEAD, Sec'y,      E. S. CHESBROUGH, City Engineer.

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## DEPARTMENTAL:

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GEO. W. WILSON, *Sup't Streets, Bridges and Public Buildings.*

WM. H. CLARKE, *Asst. City Engineer.*

E. M. JOHNSON, *Accountant and Paymaster.*

H. J. JONES, *In Charge Special Assessments.*

D. C. CREGIER, *Chief Engineer North Div. Pumping Works.*

W. R. LARRABEE, *In Charge of Water Office.*

O. F. WOODFORD, *Water Tax Assessor.*

CHAS. BROWN, *Sup't Water Meters.*

F. J. REED, *Cashier.*

F. C. MEYER, *In Charge of Map Department.*





# TABLE OF CONTENTS.

OFFICERS . . . . .	Page	2
PAST COMMISSIONERS PUBLIC WORKS...	"	2½
MAYOR'S REPORT . . . . .	"	3
Water, 4; Sewerage, 13; Streets, 17; River, 19; Fullerton Ave. Conduit, 20; Viaducts, 21; Bridges, 22; Public Buildings, 22; Parks, 23; Special As- sessments, 24; Sidewalks, 25; Conclusion, 26.		
CITY ENGINEER'S REPORT . . . . .	"	27
North Side Pumping Engines, <i>Report of Engineer</i> <i>in charge</i> , 28; Work Shops, 35; General Condition of the Works, Description and Illustrations, 37; West Side Pumping Engines, 42; Description of the Works, 45; <i>Report of Commissioners for Test-</i> <i>ing West Side Pumping Engines</i> , 51; Consumption and Waste of Water, 62; Water Pipes, Hydrants, Stopcocks, &c., 66; Old and New Lake Tunnels, Crib and Illustrations, 83; <i>Sewerage, Report of En-</i> <i>gineer in charge</i> , including History of Works and <i>Grades of Streets</i> , 118; Condition of River, includ- ing Fullerton Ave. Conduit, 132; Washington St. River Tunnel, 143; LaSalle St. River Tunnel, 150; Outside Harbor, from U. S. Engineer's Reports, 152; Death of Mr. Bryson, 162; General Plan of Chicago and Vicinity, 162.		
REPORT OF SUPERINTENDENT OF STREETS, BRIDGES AND PUBLIC BUILD- INGS . . . . .	"	163
Repairs of Bridges and Viaducts, 164; List of Bridges, stating when built, by whom, materials, 169; Blue Island Ave. Viaduct, 171; Milwaukee Ave. Viaduct, 173; Miles of Unpaved Streets, 175; List of Streets Paved, when, by whom, materials, 176; Street Cleaning and Repairs, 189; Street Lamps, 192.		
SPECIAL ASSESSMENT DEPARTMENT.....	"	194
Total Length of different kinds of Pavement in City, 202; Sidewalks, 205.		
FINANCIAL STATEMENT.....	"	206
Trial Balance Ledger of Public Works, 206; <i>Water</i> <i>Fund</i> , 214; Additions to Works, 214; Working Ex- penses and Repairs, 219; Interest, 224; <i>Scwcrage</i> <i>Fund</i> , Receipts and Expenditures, 227; Public Works Appropriation Fund, Receipts and Expenditures, 237.		



# MAYOR'S REPORT.

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OFFICE OF THE DEPARTMENT OF PUBLIC WORKS, }  
CHICAGO, MAY 1, 1877. }

*To the City Council of the City of Chicago:*

Your honorable body having, by ordinance passed on the 18th day of September, A. D. 1876, abolished the Board of Public Works, and the office of Commissioners of the Board of Public Works, and having vested all the power, duty and authority of said Board of Public Works in the Mayor of the City, Commissioners Redmond Prindiville, James K. Thompson and Louis Wahl, in accordance with the requirements of said ordinance, retired from the duties of the Board on the 19th day of September, 1876, leaving the Mayor of the city in full and complete charge of the duties of the Department.

In the retirement of these gentlemen from an office of such high responsibility and trust, they carry with them the esteem and confidence of all who are familiar with the ability, skill and energy with which they have carried forward to successful completion some of the most important public improvements undertaken by this Department, and which have contributed so largely to the fame of our city.

The official duties of the Board of Public Works will cover a period of about three-fourths of the past fiscal year, during which time all the various public improvements represented in this report, were commenced and nearly all completed. While these improvements are not as extensive in their general character as in previous years, the completion of the West Side pumping works, the Milwaukee Avenue and the Blue Island Avenue



viaducts will, undoubtedly, rank in magnitude and importance with any public work ever undertaken by this Department.

The engines connected with the new works, as will be seen by City Engineer Chesbrough's Report, were put in motion and commenced pumping on the 6th day of November, 1876; they have discharged their duty with remarkable steadiness and regularity, up to the present time, leaving no doubt in the minds of any, that they are capable of performing fully all the requirements of the contract under which they were erected, and combining in their construction the elements of capacity, durability and economy. Their completion increases the pumping facilities of the Water Works 30,000,000 gallons, making the combined pumping works 100,000,000 gallons per day.

With an aggregate daily consumption of 42,000,000 gallons required for domestic and manufacturing uses, it would hardly seem possible that an emergency could arise, which would require the combined force of these pumping engines.

The completeness and perfection of our water system, through the energy, wisdom and skill of those in charge of this great work, have brought with it protection and safety from wide-spread and devastating fires, promoting alike the vast commercial and mechanical interests of our city, as well as bringing to nearly every household an abundant and inexhaustible supply of this healthful, cleansing and purifying element.

While our city is thus favored in a general way, the rapid increase of population and growth of the more remote portions of the city seem to require that the policy heretofore pursued by your honorable body, in prosecuting and extending this work, should suffer no abatement consistent with the finances of the city, until all settled portions of the corporation shall be fully supplied.

There are now laid in the city, of various sizes, over 416 miles of water pipes; of this amount,  $6\frac{1}{2}$  miles were laid during

the past year, being a much smaller amount than was laid during any previous year since 1861.

According to official statistics of thirteen principal cities in the United States and Canada, the average percentage of water pipes in use, of six inches in diameter and less, reaches seventy and one-third per cent. Of the total amount laid in this city, the percentage of six inch pipes and less, will be about seventy and one-half per cent., leaving about thirty per cent of pipes varying in diameter from eight to thirty-six inches, laid in the central and business portions, and also the lumber district of the city.

In thus contrasting our city with others, it appears quite evident that Chicago is not inferior in the average dimensions of pipes laid, and, with an inexhaustible resource, together with our superior pumping capacity, Chicago will be ranked equal, if not superior, to any city on the continent in her facilities for supplying the general demand as well as for protection against fire.

The following table exhibits the quantity and cost of pipes laid since 1861, including the cost of five river tunnels for carrying water mains to connect the three divisions of the city:

YEAR.	NO. OF FEET.	COST.
1861.....	13,761	\$ 12,008.00
1862.....	50,881	39,197.00
1863.....	68,691	51,205.00
1864.....	62,657	104,828.00
1865.....	73,494	146,332.23
1866.....	60,550	121,589.23
1867.....	128,519	246,420.53
1868.....	161,083	266,961.35
1869.....	167,504	514,652.54
1870.....	180,727	508,855.52
1871.....	91,129	316,165.19
1872.....	122,007	317,385.06
1873.....	214,657	579,287.30
1874.....	184,723	512,781.04

YEAR.	NO. OF FEET.	COST.
1875.....	124,493	\$468,002.28
1876.....	31,100	86,997.76
		<hr/>
		1,735,976=328 miles and 4,136 feet.
Laid prior to 1861.....	87 “ “	585 “
		<hr/>
Total to Dec. 31, 1876...	415	4,721

The average cost of pipes for the year was \$33.00 per ton. The quantities represented as being laid during the years 1875 and 1876 do not include larger pipes that were substituted for smaller ones, when an increased supply was required, and the smaller either taken up or abandoned.

FIRE HYDRANTS.

Sixty-six fire hydrants were added during the year :

North Division.....	13
South Division.....	15
West Division.....	38
	<hr/>
	66
Number reported last year.....	2,835
	<hr/>
Total December 31st, 1876.....	2,901

TAPPING AND WATER PIPES.

The following statement shows the number and size of taps used in making service pipe connections during the past year :

No. of $\frac{1}{2}$ inch taps inserted.....	1,134
No. of $\frac{5}{8}$ inch taps inserted.....	558
No. of $\frac{3}{4}$ inch taps inserted.....	89
No. of 1 inch taps inserted.....	46
	<hr/>
	1,827
Total number in use.....	57,130

No. of 4 inch service connections made.....	38
No. of 6 inch service connections made.....	9
No. of 8 inch service connections made.....	0

## INCOME.

The following table shows the total income of the Water Works from the time when the distribution of water commenced :

February 15, 1854 to January 1, 1862.....	\$744,244.19
Income for fifteen months ending April 1, 1863...	189,294.80
Income for the year ending April 1, 1864.....	192,246.39
Income for the year ending April 1, 1865.....	224,902.57
Income for the year ending April 1, 1866.....	253,114.49
Income for the year ending April 1, 1867.....	302,017.59
Income for the year ending April 1, 1868.....	338,929.28
Income for the year ending April 1, 1869.....	420,686.94
Income for the year ending April 1, 1870.....	476,968.24
Income for the year ending April 1, 1871.....	539,180.19
Income for the year ending April 1, 1872.....	445,834.64
Income for the year ending April 1, 1873.....	544,465.90
Income for the year ending April 1, 1874.....	708,804.32
Income for the year ending April 1, 1875.....	705,926.64
Income for nine months ending Dec. 31, 1875.....	637,996.54
Income for the year ending Dec. 31, 1876.....	833,963.78
Total income to Dec. 31, 1876.....	\$7,558,576.50

## WATER METERS.

The number of meters added during the past year, together with those in use prior to that time, is shown in the following table :

Size of Meters.....	$\frac{3}{4}$	1	1 $\frac{1}{2}$	2	3	4	TOTAL
No. in use Dec. 31, 1875.....	314	595	166	103	182	8	1,313
No. new meters added .....	68	52	5	4	9	0	133
Total No. in use Dec. 31, 1876.....	377	647	171	107	191	8	1,446

The quantity of water measured by meters during that time was :

	GALLONS.
North Division.....	261,915,000
South Division.....	878,730,000
West Division.....	491,917,500
Total.....	<u>1,632,562,500</u>

No. of water engines in use Dec. 31, 1875.....	48
No. added during the year.....	<u>36</u>

Total number in use Dec. 31, 1876.....	<u>84</u>
--	-----------

The quantity of water used during the year is 102,985,000 gallons.

The amount collected from water meters and water engines for the year was \$159,049.45.

The general use into which water meters are being brought, particularly in cases where the consumption is large, has reached a magnitude and importance sufficient to justify at least a brief review of the principle on which is based the rates charged for water delivered through meters.

Our present system of meter-assessment is undoubtedly very unjust to the consumer, as well as being in the aggregate not sufficiently high to render that branch of the department self-sustaining, fixing, as it does, a uniform rate on the large and small consumers, differing in this respect from the regulations of other large cities, and contrary to all established principles of business. This error should be corrected at an early day, and the rates so adjusted and established that the consumer and the city alike should each be protected in their rights and interests.

These meters are not only useful in the measurement of water, but perform a most important work in detecting or indicating leakage or waste, and at some future time the city may be forced, by the immense and rapidly increasing waste, to com-

pel their adoption for the measurement of water for domestic as well as for mechanical and other uses.

#### CRIB.

The stability and permanency of the lake tunnel crib is of vital importance to the water supply of the city. It has firmly maintained its position and durability against the powerful and destructive elements of sea and ice, and, at present, shows no positive indications of weakness or decay. A substantial improvement has been added, during the past year, in the construction of a brick building for the keeper, containing five rooms, all well finished and protected from cold and dampness. A new boat has also been furnished, with apparatus for hoisting and lowering; these, with some minor additions and repairs, have placed the structure in a very complete and satisfactory condition.

#### CONDENSED STATEMENT OF RECEIPTS AND EXPENDITURES.

##### RECEIPTS.

Income from water rents . . . . .	\$833,963.78
-----------------------------------	--------------

##### EXPENDITURES.

Expense of running North Side pump- ing works . . . . .	\$146,165.04	
Expense of running West Side pump- ing works . . . . .	8,891.52	
Office expense and salaries . . . . .	42,255.99	
Repairs of pipes, hydrants, stop-cocks and miscellaneous operating ex- penses . . . . .	69,111.21	
Water meters and expenses . . . . .	15,276.50	
Interest on Water Bonds and interest on temporary loans . . . . .	391,475.80	
	<u>673,176.06</u>	
Surplus for the year ending Dec. 31, 1876 . . . . .		<u>\$160,787.72</u>



## COST OF ADDING TO THE WATER WORKS DURING THE YEAR.

Distributing pipes laid.....	\$ 86,997.76
New pumping works.....	142,240.10
New engines.....	20,763.40
Lake tunnel extension .....	1,119.33
Lake tunnel crib.....	6,542.00
	<hr/>
	\$257,662.59

## COST OF WATER WORKS.

Total cost of water works to Dec. 31, 1876, including all work in progress.....\$8,179,158.59

## MEANS BY WHICH WORKS WERE PAID FOR.

Water loan bonds, 6 per cent., out- standing .....	\$ 921,000.00
Water loan bonds, 7 per cent., out- standing .....	3,660,000.00
Water loan bonds canceled.....	239,000.00
One mill tax for 1871.....	289,746.47
One mill tax for 1872.....	284,197.43
Appropriation for 1873 .....	400,000.00
Appropriation for 1874 .....	533,705.14
Appropriation for 1875 .....	220,000.00
Appropriation for 1876 .....	391,865.19
	<hr/>
	\$6,939,514.23
Less rebates on tax. ....	30,778.05
	<hr/>
	\$6,908,736.18
From water rents .....	1,270,422.41
	<hr/>
	\$8,179,158.59

## WATER RATES.

The water rent collections for the past year present a very encouraging and satisfactory result, leaving a credit to the water fund, after paying all running expenses, salaries, and interest on water bonds, a surplus of \$160,787.72.

This amount would contribute largely to the extension of water mains, or provide the necessary funds for repairing or replacing broken and worn out machinery, or damages to other portions of the work, which may occur, requiring the expenditure of a large amount of money.

To preserve the present desirable condition of this fund, and continue the water system self sustaining in all its branches, this Department respectfully recommends that your honorable body maintain the water rates now in force. To deviate from the policy heretofore pursued, would render the city liable to direct taxation, to carry forward the extension of water mains, together with other work and improvements requiring large outlays of money. Such taxation would fall heavily in many cases where property would not be directly benefited, and would, in general, be unjust and oppressive.

Under the present system the water tax is collected from, and the fund sustained by those who consume the water, and are therefore directly benefited, a large portion of whom contribute in no other way to the support or revenue of the city. No city tax is therefore so equally and so justly distributed as is this.

The various methods of assessing water rates in all large cities, precludes the possibility of ascertaining, to a certainty, the actual difference between them in the rates charged for domestic uses, when the water is not supplied by meter measurement. Yet, from the best information which can be obtained, there is but little doubt that the water rates, as assessed and established in Chicago, are, with very few, if any exceptions, lower in the aggregate than in any other city.

The following table has been carefully prepared, showing the receipts for each million gallons of water furnished by some of our principal cities, which, in comparison, substantiates

the equity of the water rates or assessment as established in Chicago :

Milwaukee.....	\$ 48.46	per million gallons.
Chicago.....	50.30	“ “
Detroit.....	50.58	“ “
Hartford.....	63.90	“ “
Cincinnati.....	74.82	“ “
Brooklyn.....	86.28	“ “
Montreal.....	100.74	“ “
Boston.....	123.99	“ “
Cambridge.....	172.91	“ “
Lowell.....	250.44	“ “

The following table exhibits the amount of water furnished and the revenue received annually by the city, from the year 1858 to the present date :

YEAR.	Million gal- lons furnished.	REVENUE.	Revenue per million gallons.
1858.....	1,092	\$102,178 85	\$93 57
1859.....	1,415	122,753 50	86 70
1860.....	1,717	131,162 73	76 39
1861.....	1,767	131,035 10	74 15
1862 (fifteen months).....	2,705	188,448 25	85 00
1863.....	2,336	192,246 39	82 29
1864.....	2,523	224,902 57	89 14
1865.....	2,778	253,114 49	91 11
1866.....	3,169	302,017 59	95 30
1867.....	4,232	338,929 28	80 08
1868.....	5,375	420,686 94	78 26
1869.....	6,801	476,968 24	70 13
1870.....	7,945	539,180 19	67 86
1871.....	8,423	445,834 64	52 93
1872.....	10,051	544,465 90	54 17
1873.....	11,723	708,804 32	60 46
1874.....	13,903	705,926 64	50 77
1875 (nine months).....	10,957	635,996 54	58 04
1876.....	15,346	771,940 28	50 30

Among the causes, attributable to the fluctuation in the revenue received per million gallons, each year since 1858, as shown in the foregoing statement, are the large and increasing waste of water, the vast amount used in the extinguishment of fires, together with large quantities furnished the police and other departments, public parks, schools, charitable institutions,

public hydrants, and various other unavoidable supplies, from which no revenue is derived, and also a large and increasing supply furnished through meter measurement at very low rates to the various branches of manufacturing and mechanical works, hotels, tenements and other buildings.

It is quite obvious that the increasing demand from these sources, drawing more largely each year from the water supply, in proportion, than for domestic purposes, necessarily decreases the revenue on each million gallons of water furnished, and further demonstrates the necessity for a strict maintenance of the water rates as now in force.

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## SEWERAGE.

There are now completed in the city nearly 266 miles of sewerage. Of this amount (on account of the funds for sewerage construction having been exhausted), there were only built  $2\frac{1}{3}$  miles during the past year, being less than was constructed any previous year since 1862.

While the extension of this work has been vigorously prosecuted in former years, and the sewerage system of the city has, by superior engineering skill and energy, reached a highly satisfactory state of completeness, keeping pace as nearly as possible, in the extension of her mains, with the rapid growth of our city, there should be no delay in prosecuting this important work, consistent with the city's finances. There should be an extension of drainage to the more remote districts, where substantial buildings are being extensively erected, and which are rendered nearly valueless for want of this improvement.

The following statement will show the amount of sewers constructed during the past year in the different divisions of the city, together with the diameter of the same:

North Division .....	932 feet.
South Division .....	1,598 "
West Division .....	12,718 "

Total ..... 15,248 feet.

5,679 lineal feet of 1 foot diameter.

142	"	1 $\frac{1}{4}$	"
3,372	"	2	"
665	"	3 $\frac{1}{4}$	"
3,984	"	3 $\frac{1}{2}$	"
1,406	"	4	"

15,248 total lineal feet of sewer laid during the past year.

Amount laid previous to December 31, 1875, 1,388,215 lineal feet, making a total of 1,403,463 lineal feet, or 265 miles 4,263 feet, laid to December 31, 1876.

The following table indicates the total amount of sewerage constructed annually, together with the cost of the same since 1861:

DATE.		No. of Feet of Sewers Laid	No. of Catch Basins Cons'd.	No. of Man- holes Cons'd.	No. of Private Drains Laid.	Cost of cleaning Sewers and Catch Basins.	Total cost of constructing Sewers.
1861	May 6	283,586	1,174	2,102	2,194	\$ 5,619.48	\$665,188.46
1862	Jan 1	2,826	18	33	243	5,474.03	3,617.31
1863	Apr. 1	15,676	72	66	365	4,793.35	57,264.51
1864	" 1	39,605	232	204	536	5,123.39	169,299.29
1865	" 1	25,021	188	183	512	9,364.68	87,221.48
1866	" 1	29,948	223	168	1,288	13,818.07	137,643.02
1867	" 1	48,127	327	271	3,722	28,445.16	225,564.53
1868	" 1	89,661	418	555	3,703	26,540.81	416,730.51
1869	" 1	47,841	480	293	3,261	26,954.06	197,152.92
1870	" 1	139,705	771	928	3,979	26,015.18	654,141.26
1871	" 1	78,166	626	468	5,187	21,464.30	258,664.70
1872	" 1	50,716	277	300	3,093	17,415.46	153,295.36
1873	" 1	47,342	245	341	1,435	21,484.16	173,255.76
1874	" 1	146,702	897	1,015	4,691	31,229.27	506,283.45
1875	" 1	222,322	1,054	1,474	6,292	37,034.82	587,507.38
1876	Jan. 1	120,971	958	789	3,365	32,098.23	342,932.89
1877	"	.....	.....	.....	.....	39,345.41	83,215.17

## REPAIRS.

The cost of repairing sewers and catch-basins, and of removing and repairing man-holes and their covers has been, for the year \$6,069.99.

## PRIVATE DRAINS.

The number of private drains connected with the public sewers are as follows:

North Division .....	264
South Division .....	258
West Division .....	650
Total .....	<u>1,172</u>

The receipts for the year for private drain permits have been \$16,492.79.

## SEWERAGE EXPENSE, REPAIRS AND INTEREST.

Salaries, office and miscellaneous expenses .....	\$ 8,043.94
Repairs, North Division .....	1,305.71
“ South Division .....	2,102.61
“ West Division .....	2,661.67
Cleaning, North Division .....	8,191.96
“ South Division .....	9,115.47
“ West Division .....	12,037.98
Street intersections .....	13,382.90
Interest .....	<u>418,553.21</u>
	\$475,395.45
Less interest paid on River Improvement bonds, 186,182.92	<u>186,182.92</u>
	\$289,212.53

## SEWERAGE LOAN BONDS.

Six per cent. bonds outstanding Dec. 31, 1876 ....	\$ 87,000.00
Seven per cent. bonds outstanding Mar. 31, 1876 ..	<u>2,550,000.00</u>
Total .....	\$2,637,000.00



FIRST ANNUAL REPORT OF  
SEWERAGE SINKING FUND.

Amount of money in the hands of the City Treasurer,  
Dec. 31, 1876, not applied to canceling bonds ...\$55,088.16

SEWERAGE VENTILATION.

Recent events, as well as the investigation of experienced civil engineers, have demonstrated the fact, that there is a demand, that some practical and thorough system of ventilating the sewers of the city should be adopted and strictly enforced. To those familiar with the great evils resulting from imperfect and defective drainage, the necessity for a positive and speedy remedy will be quite apparent; and to this end the encouragement and aid of the city government should be brought to co-operate in every way, to perfect and establish this most important of all city improvements.

As a sanitary measure, the experiments already made by practical and scientific men, in buildings which have been infected with poisonous gases arising from defective drains, have proved a perfect and complete success, and demonstrated beyond a doubt the incalculable benefits arising from a thorough and practical sewerage ventilation.

The general adoption of a simple and inexpensive improvement would undoubtedly bring with it a large decrease in the general diseases, if not materially lessen the total death rate in our city.

The application of this improvement to all private or house drains, connecting with a shaft constructed for the purpose, or attaching the ventilating pipe with the main flue of the building, would be an effective and inexpensive method of controlling and eradicating this great evil.

That the importance of this safeguard to the general health of the city is sufficient to warrant the City Government in controlling this, as well as other regulations connected with the

erection of buildings, is beyond a doubt : and perhaps no improvement would be more generally endorsed, or bring to our citizens a more valuable and satisfactory result.

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### STREETS.

There are, at present, over one hundred and twenty-seven miles of streets, improved by cindering, graveling, macadamizing, stone and wooden block pavement. Of this amount eleven miles were improved during the past year. There are in the city about one hundred miles of streets improved with the wooden block pavement, constructed in various forms and devices, according to the wishes of the property owners upon the line of the street or streets to be paved. A large portion of such work is done under private contract with such property owners, the city not interfering or dictating as to the kind or form of pavement to be used. The equity of such permission would seem perfectly proper and just, but the wisdom of the policy, which fails to adopt a uniform system of paving, is somewhat questionable. From past experience and observation we are forced to the conclusion that the city should have control of the streets, dictating and deciding as to the kind of improvement to be used, as well as fixing the time for doing such work, when required by public necessity.

While such a law might seem arbitrary, there is no doubt that the result would be a more substantial and uniform improvement, which would be vastly more beneficial to the whole city

The condition of our streets, both improved and unimproved is by no means satisfactory to this department or the public at large. Owing to various causes, such as the use of improper material, the rapid decay of the same and the increasing travel and traffic over our wooden block pavements, many of our streets are in a condition requiring repaving, while many

others require extensive and thorough repairs. To accomplish so extensive a work would have required a very large expenditure of money, which the financial condition of the city, as well as that of the property holders did not justify. To delay this improvement, and only do such street repairs as were necessary for safety and comfort, was, under the circumstances, considered advisable. While it would be very desirable to place our streets in a better condition, yet the city has suffered no material loss or inconvenience by the temporary postponement of this work.

In view of the fact that the average life of our pine block pavement does not exceed six years, it is quite apparent that a material, more substantial and lasting, should be substituted, especially in the central or business portion of the city. The incomplete condition of our streets, requiring frequent excavations for various purposes, as well as the change of grades, necessary to be made for a more complete and thorough drainage, has made the pine block pavement, on account of its cheapness and easy process of removing and replacing, answer a very desirable purpose up to the present time. But, with the grades established and the underground improvements completed, making our streets ready for a more permanent improvement, the pine block pavement may very soon be transferred from our heavily traveled and business streets to the more private or residence thoroughfares of the city. Experiments which have been made in this and other cities in the various forms and kinds of wooden block pavements, have demonstrated that cedar blocks, being equal in other respects and less liable to decay, are superior to pine in their quality for durability and wear, giving them an average life of one-third longer than that of other block pavements.

A more extended test in other cities has resulted in the almost total abandonment of pine and the adoption, to a great extent, of the cedar blocks.

The question as to the best method of improving streets being of such importance to our city, and having observed and investigated carefully the good and defective qualities of the various kinds in use, I am inclined to believe that the adoption of cedar blocks, properly placed upon a firm, substantial and carefully prepared foundation, would put our city in possession of a pavement that would be more durable and economical.

The large amount of money that will be required very soon to replace the worn out pavements, suggests the propriety of some legislation that will lighten taxation, and, at the same time, hasten the completion of our streets by some desirable improvement. There is, perhaps, nothing more likely to meet the present demand and bring more satisfactory results, than the passage of a law fixing the collection of taxes by special assessment in installments, as recommended in the Fifteenth Annual Report of the Board of Public Works. The present burdensome and oppressive system of collection not only retards greatly the improvement of our streets, but compels, in very many cases, the tax payer to resort to the courts, if for no other purpose, to extend as far as possible the time of payment. The complete success of the law referred to in other large cities, is sufficient to warrant its adoption, which would, without doubt, result in a more speedy and complete improvement of our thoroughfares.

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### THE RIVER.

The year closes without completing any improvements, which have been designed for the purpose of cleansing the river. On account of legal obstructions to the erection of the dam across the entrance to the Ogden and Wentworth ditch, the

contract which was awarded for doing the work has not been carried out. Yet an amicable adjustment of the difficulty between the parties interested, is looked for at an early date, when the improvement will be at once completed. This will enable the deepened Illinois & Michigan Canal to perform its part in cleansing the South Branch of the river.

The final completion of the Fullerton Avenue conduit is not looked for until late in the coming summer or fall, which will leave the North Branch, for several months to come, in much the same condition as in former years. The very high water which has prevailed in the lake and river during the past year, has obviated the necessity for the usual amount of dredging, and has been beneficial in cleansing and divesting the river of much of its offensiveness.

The amount expended for dredging was \$13,684.03.

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### FULLERTON AVENUE CONDUIT.

The work of constructing the Fullerton Avenue conduit, although the conditions of the contract required its completion on the first day of December, is progressing very satisfactorily. The contractors met with unexpected and unavoidable hindrances, which will delay the completion of tunneling and masonry until late in the spring, and the placing in position of the lake shaft and pier protections still later in the summer. The construction of the pumping machinery and buildings at the river end remains to be arranged and contracted for, which will carry the final completion of the work until late in the coming summer.

The amount expended upon this work up to December 31, 1876, is .....	\$393,169.28
The estimated amount required for its completion, including the machinery and buildings, is.....	178,461.79
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Making the total cost, when completed.....	\$571,631.07

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## VIADUCTS.

During the past fiscal year a viaduct has been erected over the railroad tracks at Blue Island Avenue, and the buildings fronting on the approaches to the viaduct have been raised to the new grade and put in good condition at a total cost of \$95,481.73.

The viaduct now in course of erection over the railroad tracks at Milwaukee Avenue and Desplaines street, is now rapidly approaching completion, and will be ready for public use in the early part of May, being much later than the time fixed by contract, owing to some unavoidable delays. The work of raising the buildings fronting the approaches of the viaduct to the new grade, has not progressed satisfactorily, owing largely to the insufficient amount appropriated by your honorable body for this purpose, and making it necessary for this Department to ask an additional appropriation to cover the deficiency.

The amount expended to Dec. 31, is.....	\$ 86,158.30
The amount required for completion.....	148,155.19
	<hr/>
Making the total cost.....	\$234,313.49

The completion of these viaducts will not only contribute largely to the safety and convenience of a large portion of our citizens, they are also substantial evidence of engineering and mechanical skill, and add to the many famous structures of our city.

## BRIDGES.

While no new bridges have been erected over the river during the past year, great care and labor has been expended in placing those already constructed in a firm and substantial condition.

The completion of the Harrison street bridge is still unavoidably delayed. The attempt to negotiate by arbitration for the land required for widening the river at this point having failed, the condemnation proceedings were allowed to pass through the courts for adjustment, which will postpone the completion of the work until late in the coming summer.

The construction, management and maintenance of our bridges are material, in no small degree, to the commercial and mechanical, as well as all the public and private interests of the city. The immense travel and traffic passing over and through them by day and by night, suggests that nothing should be omitted in their construction or management, which would insure safety to life and property, or facilitate in every possible way the business in transit over and through these great highways.

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## PUBLIC BUILDINGS.

The only building erected during the past year under the immediate control and supervision of this department, is the engine house and tower for the stand pipe for the West Side pumping engines. This building was completed in the month of November, 1876, at a cost of \$54,049, and presents the appearance of a substantial and durable structure, with no pretensions to ornamental or architectural display. It is admirably arranged and adapted, in all its parts, to the purpose for which it was designed.

The action of your honorable body, up to the present time, in the matter of building the new city hall, has not resulted in any definite arrangement for the immediate commencement of this work, the present situation differing very little, if any, from that represented in the last annual report of the Board of Public Works.

The necessity for more adequate and convenient space for the transaction of business in the different departments of the City Government, the extremely low prices of material and labor, and the benefits accruing by a joint action of city and county in the construction of the exterior portion of the building are among the principal inducements urged for the immediate prosecution of this work.

It is, however, to be regretted, that while great benefits would have been derived in constructing the building under such advantageous circumstances, the financial condition of the city did not justify such action. Therefore it was believed that the interests of all would be better served by still further delaying the construction of this edifice.

Late improvements and repairs made in the building now temporarily used as a City Hall have rendered it sufficiently convenient and comfortable to warrant its occupancy by the City Government until the completion of the new building.

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## PARKS.

The amount of money appropriated by your honorable body for the maintenance of the various parks under the control of this department, has been barely sufficient to employ the necessary labor for keeping them in an acceptable condition.

The parks being mostly in a state of completion, it was deemed advisable that no ornamentation or improvements of a



permanent nature should be added during the year. Sufficient grounds on Lake Park have been completed to accommodate all who may choose to avail themselves of this desirable place for rest and recreation.

There is much remaining to be done, in the way of filling which, however, will be furnished without any great expense to the city. When fully completed, this will be one of the most accessible and desirable parks in the city.

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### SPECIAL ASSESSMENTS.

The propriety of paving or improving our streets under private contract, rather than under special assessment, is a question of sufficient importance to property owners, as well as to the City Government, to demand a careful consideration.

One of the many evils arising by improving under private contract, is the practice, in some cases, of omitting the pavement in front of lots, where the owners have failed or refused to become a party to the contract, leaving the city to provide in some way for the improvement of the space thus left, which can only be accomplished by special assessment, and necessitates leaving the street in an incomplete and very unsatisfactory condition for a long and indefinite period.

While an emergency may arise, where the city would be justified in granting permission to improve a street by private contract, in no event should such permit be granted, without requiring the contractor to make the work complete along the whole line of the improvement. The advantages derived by paving our streets under special assessments, are manifold. This system not only provides for a uniform and finished improvement, but secures the benefit of competition in proposals for doing the work. It also secures a saving to the property owner

or tax payer of at least twenty-five per cent. in comparison to prices paid to private contractors for the same quality of work.

The present system of improving our streets is deemed of sufficient interest to respectfully direct your attention to the report of Mr. Jones, in charge of the special assessment department, for a more full and complete explanation of the matter above referred to.

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### SIDEWALKS.

Your honorable body having, by resolution passed on the 7th day of June, 1876, discontinued the office of Superintendent of Sidewalks, and the services of Sidewalk Inspectors, the report appearing formerly under this branch of the Department will be found embodied in the report of Special Assessments.

Since the abolition of this office much has been accomplished under the present system of inducing property owners to construct and repair the sidewalks in front of their property, without obliging the city to levy a special assessment for that purpose.

There has been constructed during the year, of new walks, over 25 miles, making a total of over 673 miles of sidewalk in the city.

## CONCLUSION.

The policy adopted in curtailing the public expenditures of the city government during the past year, has been enforced in this department of the public service, in all its various branches.

The great reduction in the numbers employed, and the decreased compensation of those remaining in the service of the city, has lessened the annual expenses of this Department fully one-half, in comparison to that of previous years.

While retrenchment has been so strictly adhered to, and the amount of money expended in public improvements and street work so greatly reduced, no portion of the public works essential to the general welfare of the city has been slighted or neglected, and never have our public improvements been more thoroughly, efficiently and successfully carried forward.

The reform, so necessary to the welfare and prosperity of the city under its present financial condition, has resulted in no material damaging effects to public or private interests, and in no great degree has the city suffered inconvenience or loss by the adoption and enforcement of such a line of policy.

You are respectfully referred, for information in detail, to the report of the heads of the various branches of this Department.

MONROE HEATH, *Mayor.*





# CITY ENGINEER'S REPORT.

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CHICAGO, APRIL, 30, 1877.

*Hon. Monroe Heath, Mayor:*

*Sir:*—In submitting his Report for the year ending December 31, 1876, the City Engineer, as usual, presents first the operations and condition of the North Side pumping works as stated by the engineer in charge of them.

REPORT OF THE ENGINEER OF THE PUMPING  
WORKS.

“NORTH PUMPING WORKS,” }  
CHICAGO, MARCH 20, 1877. }

E. S. CHESBROUGH, Esq., *City Engineer*:

SIR:—The twenty-third annual report of the operations of these works being for the year ending December 31, 1876, is herewith submitted:

The former reports of these works embraced a record of the entire quantity of water pumped for the city, but during the latter part of the past year, a portion of the water was pumped by the “West Pumping Works,” consequently the comparisons usually made with other years, refer to these works only.

The total quantity of water pumped for the year, as shown by the records, is 14,525,858,798 gallons.

The daily average quantity pumped for the nine months—constituting the term of the last annual report—was a trifle over thirty-nine and three-quarter million gallons.

The daily average during the past year is about the same as that for the nine months embraced in last report.

The greatest daily average for a single month was in August last, being nearly forty-four and one-half million gallons, while the largest quantity pumped in one day in that month, was forty-six and three-quarter million gallons.

The following tabulated record shows in detail the operations of the engines and boilers during the year.

## OPERATIONS OF ENGINES AND BOILERS.

Months	No. of Days	No. of Hours Run per Month	Average No. of Hours Run per Day	Total Revolutions per Month	Average No. of Revolutions per Day	Total No. of Gallons of Water Pumped per Month	Average No. of Gallons of Water Pumped per Day	Total pounds of coal consumed per Month for pumping	Average No. of pounds of coal consumed per day for Pumping.
1876, January..	31	744 00	H. M. 24 00	663,259	21,395	1,208,668,563	38,989,308	2,564,900	82,741
February..	29	696 00	24 00	619,023	21,345	1,169,388,859	40,823,753	2,579,020	88,932
March....	31	744 00	24 00	670,087	21,615	1,244,271,298	40,137,783	2,808,620	90,800
April.....	30	719 30	23 59	635,298	21,176	1,169,825,598	39,994,186	2,617,160	87,238
May....	31	744 00	24 00	1,020,864	31,931	1,306,577,131	42,147,049	3,043,300	98,364
June .....	30	720 00	24 00	684,800	22,827	1,237,317,437	41,243,914	2,640,560	88,018
July.. ....	31	744 00	24 00	715,934	23,093	1,358,752,909	43,831,061	2,924,400	94,335
August ...	31	744 00	24 00	710,089	22,906	1,376,469,544	44,408,695	2,972,160	95,876
September	30	719 55	23 59	622,600	20,755	1,243,745,860	41,458,195	2,615,520	87,184
October..	31	744 00	24 00	685,514	22,113	1,268,071,044	40,905,517	2,658,560	85,760
November	30	720 00	24 00	412,053	13,735	1,015,851,277	33,861,709	2,028,360	67,545
December	31	742 45	23 57 $\frac{1}{2}$	772,275	24,912	896,709,283	28,926,106	1,956,120	63,560
Totals .....	366	8,782 10	23 56 $\frac{1}{2}$	8,211,926	268,803	14,525,858,798	476,227,876	31,412,770	1,030,153
Gen'l av per M	.....	731 50 $\frac{1}{2}$	.....	684,219	.....	1,210,488,233	.....	2,617,731	.....
Gen'l av per D	.....	23 59 $\frac{1}{2}$	.....	22,436	.....	39,688,138	.....	85,827	.....

NOTE.—Coal used for heating premises, pumping out wells, and running large Knowles pumps, included in above amounts.



A portion of the pumping machinery has been in operation constantly. The total running time for the year being 8,782 $\frac{1}{2}$  hours, being an average of 23 $\frac{5}{8}$  hours per day.

The total quantity of water pumped, and the time run by the several engines respectively, are set forth in the annexed tables.

ENGINES DESIGNATED AS	HOURS AND MINUTES.	TOTAL REVOLUTIONS	TOTAL GALLONS OF WATER PUMPED.
	H. M.		
1853 .....	3,384 36	2,141,210	1,110,859,746
1857 .....	1,424 32	882,184	719,821,844
1867 .....	855 22	650,873	627,533,287
1872 .....	8,017 30	4,537,609	12,029,972,849
New Steam Pumps.....	116 30	1,027,328	87,671,622
Totals .....	13,798 30	9,239,154	14,525,858,798

### FUEL.

Coal has been received and used as follows :

	TONS.	POUNDS
On hand January 1, 1876.....	535	1,945
Received of Pittsburg Nut.....	91	165
“ Midway .....	1,647	740
“ Minonk .....	257	1,980
“ Wilmington.....	117	1,390
“ Shawnee .....	91	20
“ Erie.....	292	1,180
“ Lackawanna .....	13,028	1,430
	TONS.	POUNDS.
Used for pumping, heating build- ing, pumping out well, etc. ....	15,707	1,200
Used for workshop, pipe lay- ing, etc .....	108	780
On hand January 1, 1877.....	246	870
Total.....	16,062	850
	16,062	850

EXPENSES DUE TO PUMPING.

Salaries of engineers .....	\$ 6,091.05
Labor, firemen, etc. ....	15,336.72
15,706 <sup>770</sup> / <sub>2000</sub> tons of coal at an average cost per ton of \$7.15 <sup>7</sup> / <sub>10</sub> .....	112,410.90
548½ gallons of lard oil. ....	545.64
238½ gallons of cylinder oil. ....	206.09
213¾ pounds of lubricating compound. ....	39.02
1,462½ pounds of waste. ....	162.88
215½ pounds of packing. ....	89.42
Small stores. ....	111.48
Gas for lighting works. ....	1,466.35
Repairs of boiler room tools. ....	94.29
Repairs of engines. ....	1,453.15
Repairs of boilers. ....	927.73
	<hr/>
	\$138,934.72
Cost of delivering water per million gallons. ....	\$9.56 <sup>4</sup> / <sub>10</sub>
Cost of repairs per million gallons. ....	.17

DISTRIBUTED AS FOLLOWS:

To engines .....	10 <sup>6</sup> / <sub>10</sub>
To boilers. ....	6 <sup>4</sup> / <sub>10</sub>

The following is the cost of delivering water per million gallons during the past ten years, and cost of coal :

	Average cost of coal per ton.	Cost per million gallons.
1868. ....	\$ 7.03	\$ 11.87
1869. ....	7.60	12.45
1870. ....	6.93	11.71
1871. ....	7.49	11.31
1872. ....	8.09	12.02
1873. ....	7.18	11.64
1874. ....	8.56	12.86

1874-5.....	8.27	12.26
1875 (nine months).....	7.93	10.81
1876.....	7.15	9.56
	<hr/>	<hr/>
Average for ten years.....	\$7.62	\$11.64

The quantity pumped each month for the past ten years, is as follows:

TABLE SHOWING QUANTITY OF WATER PUMPED AT THE NORTH DIVISION PUMPING WORKS EACH MONTH DURING PAST TEN YEARS.

MONTHS.	1867-68.	1868-69.	1869-70.	1870-71.	1871-72.	1872-73.	1873-74.	1874-75.	1875.	MONTHS.	1876.
C April.....	281,904,710	376,430,083	515,558,836	561,266,364	720,000,000 713,000,000 735,000,000 806,000,000 868,000,000 780,000,000 442,337,951 657,138,219 620,598,358 684,569,031 668,788,030 728,459,377	696,411,330	916,329,315	969,285,640	1,243,837,877	January...	1,208,688,563
May.....	282,813,313	402,382,583	511,024,720	628,128,473		758,520,288	951,025,086	1,044,115,222	1,256,605,053	February..	1,169,388,859
June.....	318,358,925	422,909,052	537,626,771	730,501,639		748,938,470	936,614,148	1,010,002,523	1,163,985,505	March ....	1,244,271,298
July.....	363,322,276	505,513,404	641,359,425	766,072,060	ESTIMATED - See report by Fire, City, 71.	876,206,981	1,000,695,844	1,297,543,064	1,239,434,124	April .....	1,199,825,593
August.....	375,441,736	482,160,940	626,549,674	797,090,274		852,976,814	1,033,164,846	1,322,546,647	1,272,876,926	May.....	1,306,577,131
September...	354,965,654	447,213,481	592,379,232	751,256,836		842,668,858	973,690,925	1,246,442,604	1,199,570,888	June.....	1,237,317,437
October...	377,585,973	456,278,707	556,909,988	694,056,940	ESTIMATED - See report by Fire, City, 71.	843,791,209	1,018,933,312	1,151,106,735	1,227,568,188	July ....	1,358,762,909
November..	350,800,232	430,887,264	550,754,730	650,930,982		833,879,447	1,023,633,854	1,036,221,656	1,160,694,177	August.	1,376,669,544
December...	378,710,850	466,284,049	569,074,149	558,179,911		877,853,981	1,026,230,398	1,140,266,745	1,192,680,258	September.	1,243,745,860
January .....	380,912,240	457,504,543	548,247,452	602,621,440	Actual.	905,391,154	955,646,383	1,193,462,490	1,193,462,490*	October...	1,268,071,044
February ....	380,867,239	418,212,220	525,713,115	547,675,127		838,244,790	884,813,362	1,136,965,231	1,136,965,231*	November..	1,015,851,277
March ...	386,108,511	508,148,250	625,948,628	656,904,794		976,055,777	1,002,041,559	1,355,239,536	1,355,239,536*	December..	869,709,283
Totals.....	4,231,791,659	5,374,624,576	6,801,146,720	7,944,684,840	8,423,890,906	10,050,939,189	11,722,819,032	13,903,197,493	14,642,920,253	Total..	14,525,858,798

\* Those three months' figures were borrowed from the previous year (the commencement of the municipal year having been changed). In order to make up twelve months' work. They exceed the actual quantity pumped by 63,338,537 gallons, but it being a leap year, there were twenty-nine days in February, besides which the new pumping works were in operation.

TABLE SHOWING TOTAL QUANTITY OF WATER PUMPED,  
TOGETHER WITH ANNUAL AND DAILY INCREASE IN QUANTITY AND RATE PER CENT.  
ALSO, THE GREATEST DAILY AVERAGE FOR A SINGLE MONTH, FOR THE FOLLOWING YEARS :

YEARS.	Total Quantity Pumped. GALLONS.	Annual Increase. GALLONS.	Average Daily Quantitv Pumped GALLONS.	Average Daily Increase. GALLONS	Per Cent. of Annual Increase.	Greatest Daily Average.	
						MONTHS.	GALLONS.
1858 .....	1,091,865,459	.....	2,991,413	.....	.....	September.....	3,617,818
1859.....	1,415,147,910	323,282,453	3,877,119	885,706	29.6	October .....	4,565,388
1860....	1,716,786,552	301,338,642	4,703,525	826,406	21.29	July .....	5,367,569
1861.....	1,767,154,689	50,368,137	4,841,520	137,995	2.93	August.....	5,438,790
1862....	2,217,279,739	450,125,050	6,074,739	1,233,219	25.47	July .....	6,748,899
1863.....	2,336,108,454	118,128,715	6,400,298	325,559	5.32	January .....	6,770,483
1864.....	2,523,339,218	187,230,764	6,913,259	512,961	8.01	August.....	8,293,850
1865....	2,777,817,349	254,478,131	7,610,459	697,200	10.08	September.....	8,871,530
1866.....	3,168,760,609	390,943,260	8,681,536	1,071,077	14.07	July.....	10,022,164
1867.....	4,281,791,659†	1,063,031,050	11,562,273	2,890,737	33.54	March.....	12,455,113
1868.....	5,374,624,576	1,142,832,917	14,724,999	3,162,726	27.00	March.....	16,414,460
1869.....	6,801,146,720	1,426,522,144	18,633,278	3,908,279	26.54	July .....	20,689,014
1870 ...	7,944,684,840	1,143,538,120	21,766,260	3,133,082	16.81	August.....	25,712,589
1871.....	8,423,890,966	479,206,486	23,464,877	1,698,617	6.03	August .....	28,000,000
1872....	10,050,939,189	1,627,048,223	27,536,819	4,071,942	19.31	March .....	31,485,670
1873.....	11,722,819,032	1,671,879,843	32,117,312	4,580,493	16.63	November .....	34,121,128
1874.....	13,903,197,493	2,180,878,461	38,090,952	5,973,640	18.59	March.....	43,717,404
*1875 (9 Months).....	10,957,252,996	† 739,722,760	39,844,556	1,753,604	7.24	April .....	41,461,262
1876 (12 Months)...	14,525,858,798	.....	39,688,138	.....	.....	August.....	44,408,695
Average for 19 years...	5,944,761,381	.....	16,817,017	.....	.....	.....	18,850,622

\* Municipal Year changed from April 1st to January 1st.  
† Compared with same months of the year before.

## SHOPS.

The amount of work done in the shops connected with these works is as follows :

## NEW HYDRANTS.

Single (2½ inch) nozzle.....	18
Double (2½ inch) “.....	28
Double (4 inch) “.....	19
Total.....	65

All of which have been put in use.

## NEW STOP VALVES MADE.

Four inch.....	88
Six inch.....	80
Eight inch.....	90
Twelve inch.....	14
Sixteen inch.....	9
Twenty-four inch.....	3
Total.....	284

Of this number there have been used..... 221

Leaving on hand January 1, 1877..... 63

Of the following sizes, viz :

Four inch.....	5
Six inch.....	5
Eight inch.....	41
Twelve inch.....	4
Sixteen inch.....	7
Twenty-four inch.....	1
	63

In addition to the foregoing, considerable work has been done in the shop for the street, bridge, water and other city departments.

The cost of running the shop, exclusive of labor, is, for

coal, oil, gas, etc.....	\$ 963.20
Repairs and alterations of building.....	268.59
Superintendence (deducted from engineer's salary)....	323.36
	<hr/>
	\$1,555.15

A new boiler was put in shop in January last, in place of the old one, which had become much worn, and too small to meet the demands.

The cost of the new boiler, together with setting, etc.,

was .....	\$ 421.64
Cost of repairs of tools and machinery.....	230.69
Cost of tools previously reported.....	6,052.36
	<hr/>
Total value of tools .....	\$6,704.69

The value of the hydrants and stop valves before noted,

as on hand January 1, together with the raw material in the shop, is.....

\$3,223.54

Total value of stock and tools.....\$9,928.23.

Deducting the cost of running shop as above noted, also deducting eight per cent. interest on total cost of tools, together with four per cent. for depreciation of same, and estimating the value of work manufactured at less than current prices for like articles, the nominal net earning of the shop is \$1,147.05.

About two-thirds the space constituting the shop building is now occupied by the Fire Department, and used as a general repair shop for its engines and other apparatus. The lathes and other power tools already referred to, are used, in common, for doing the work of both the fire and water departments.

The building known as the shop was rebuilt immediately after the great fire of "'71." In its reconstruction, considerable of the ruin of the former structure was utilized, so after its

completion, it presented a medley of colors. Nothing has been done upon the walls since it was built, and they are therefore sadly in need of a uniform coloring and painting to make the building sightly in appearance, and somewhat in harmony with the surrounding structures, an improvement which would involve but a small outlay of money.

#### GENERAL CONDITION OF THE WORKS.

Beyond the usual work incidental to the care and operation of large machinery, there is little of importance in connection with it that needs to be referred to here.

The south engines have been in continuous operation ninety-one per cent. of the time during the past year, pumping more than seven-eighths of the total quantity of water. They were stopped, at the beginning of the year, received a general overhauling, and are now running. The pumps of "67" engine, at present writing, are being fitted with new valves, which will be completed in the course of two or three weeks.

The west pump of "57" engine has also been fitted with a new double-beat valve, like that put in the east pump last year, which, in its operation, is satisfactory, and a notable improvement upon the old valves, which are of composition, and as old material, will more than pay for the change made.

The large Knowles pumps, referred to in the last annual report, were set up and connected in May last. Soon after, they were started, and kept in operation for a brief period, as an auxiliary to the three main engines, while the largest engine was stopped for packing, etc.

There will be more or less work of a minor character to be done during the coming year; but now that the "West Pumping Works" are in operation, with a capacity sufficient to



greatly relieve the North Works—repairs can be made with more deliberation and less anxiety in regard to interrupting the supply than heretofore.

In the month of March last the new and old lake tunnels were connected by a twenty-four inch pipe, forming a “siphon.” This arrangement serves to conduct the water from new tunnel to old pump wells, and answers the purpose whenever occasion requires.

#### BUILDINGS.

The main building and boiler houses are generally in a good state of repair, with the exception of the roofs. Those of the boiler houses are covered with slate, which is laid on an iron framework, which presents very poor facilities for a proper fastening of the slate; the roofs have therefore become leaky, and otherwise dilapidated. The roof over the main building has leaked more or less ever since it was erected, badly damaging the plastered ceiling, and otherwise causing discomfort and inconvenience. In December last, it was discovered that the valley rafters of this roof were yielding; temporary measures were immediately adopted for supporting the portion that had settled, after which the structure was permanently strengthened by putting in much heavier iron trusses. In doing this work, a portion of the plaster was knocked off the ceiling, rendering it probable that the entire ceiling will eventually have to be reconstructed.

#### THE GROUNDS

West of main building and surrounding the tower are in excellent condition. A portion of the iron fence at the southwest corner of the ground was considerably damaged by the terrific gale which swept over the city on the sixth of May last; at the same time the scale house was completely demolished, and a portion of the shop roof blown off. The scale house has been

replaced by a new and more substantial structure, and the shop roof promptly repaired. The iron fence will be reset as soon as the weather will permit.

There is an important matter in connection with the grounds immediately west of main building, which will doubtless soon engage the attention of the proper authorities. When the grounds were laid out, the driveway and main sidewalks were covered with asphaltum, and otherwise made very neat and substantial. The driveway is only seventeen feet between curbs, curving to the east and west in the center of block, forming a circle of fifty-eight feet diameter, and again merging into a single seventeen feet passage. In the center of the circle is located a large basin, forming a fountain.

Since the grounds were laid out and the works built, the Lake Shore Drive has been completed. The main approach to this drive from south of the works, is through the narrow driveway referred to, passing the fountain. In pleasant weather there are great numbers of pleasure vehicles driving to and from the Lake Shore Drive, via the narrow passage in front of the works, which is illy-adapted to a thoroughfare, and consequently there are frequent collisions, owing to the limited quarters: besides, horses do not appreciate the beauties of the fountain, which they are obliged to pass, much to the danger and annoyance of their drivers. From this cause there is considerable complaint on the part of the public, who use the driveway in front of the works. If this passage is to be used as an approach to the Lake Shore Drive, I would suggest that the fountain be removed, and the carriageway be widened to the extent of the present circle, which would make it fifty-eight feet.

The grounds east of the building are in an unsightly condition as yet. If circumstances permit, the old iron fence will be put upon the south line during the next season, and some grading will be done. The ends of Chicago avenue and Pearson

street have been filled up and graded with the ashes from the works, so the streets are now passable for vehicles.

When the present buildings were erected, ten years since, the old coal houses were demolished; none have been put up in their stead. Frequent reference has been made in regard to the necessity of coal houses. Ample and convenient covering is important to preserve the fuel, and protect the men who are obliged to handle it, from the inclemencies of the weather.

#### ILLUSTRATIONS

Are herewith submitted of the several engines now in use at the North Works.

PLATE I. is an elevation of the first engine erected. It was started December 16, 1853. During a service of nearly twenty-four years, it has not been disabled by breakage or accident for a single hour, and is now in good running order. The dimensions of the principal parts are noted on the plate.

No. II., is an elevation of the second engine erected. It was put in operation in July, 1857. Some parts of this engine were made to conform to the conditions of the building. Owing to the position of the tower, the valve gear or "front" of the engine was placed on the side, as it was deemed imprudent to cut the corner of the tower to admit locating the front in the usual place. The entire foundations of this engine were constructed during the night, as they were located in the then only pump-well, which was in use during the day, leaving the south reservoir to supply the city at night.

The engine here referred to, has been in use over nineteen years, and, like its patriarchal neighbor, is in condition for daily service. The dimensions of principal parts are given on illustration.

N<sup>o</sup> 1

ERECTED

1853

SINGLE ENGINE

Capacity  $7\frac{1}{2}$  Million Gallons In 24 Hours

Steam Cyl. 44<sup>in</sup> Diam 9<sup>ft</sup> Stroke

Bucket - Water Pumps 34<sup>in</sup> Diam 5<sup>ft</sup> 6<sup>in</sup> Stroke

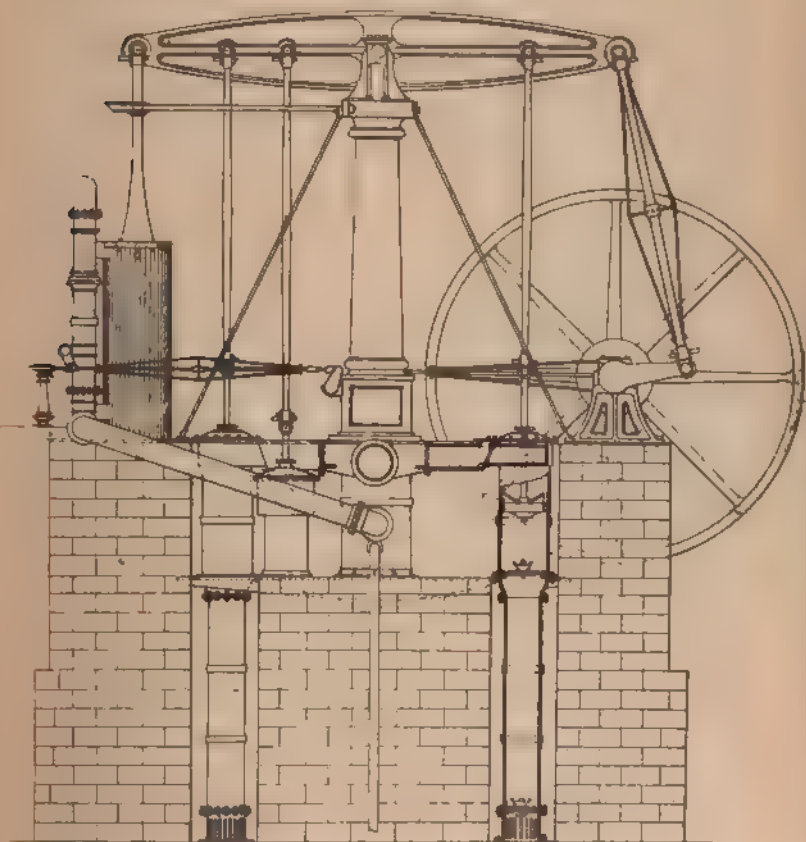
Length Of Working Beam 30<sup>ft</sup>

Weight " " " 9 Tons

Diameter Of Fly Wheel 24<sup>ft</sup>

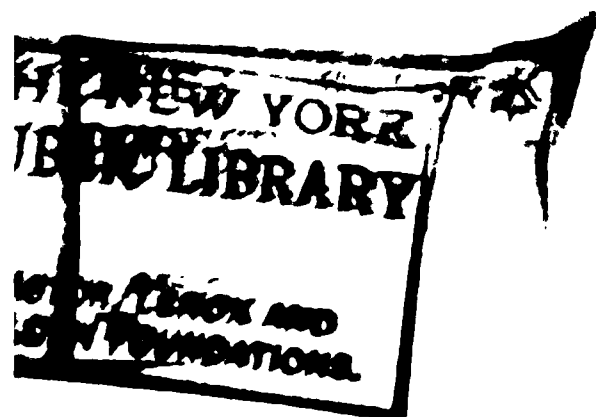
Weight " " " 12 Tons

Cost Of Engine & Boiler \$24 500<sup>00</sup>



Scale of Feet





N<sup>o</sup> II

ERECTED

1857

SINGLE ENGINE

Capacity 13 Million Gallons in 24 Hours

Steam Cyl. 60<sup>in</sup> Diam. 10<sup>ft</sup> Stroke

Bucket & Plunger - Water Pumps 40<sup>in</sup> Diam. 6<sup>ft</sup> 3<sup>in</sup> Stroke

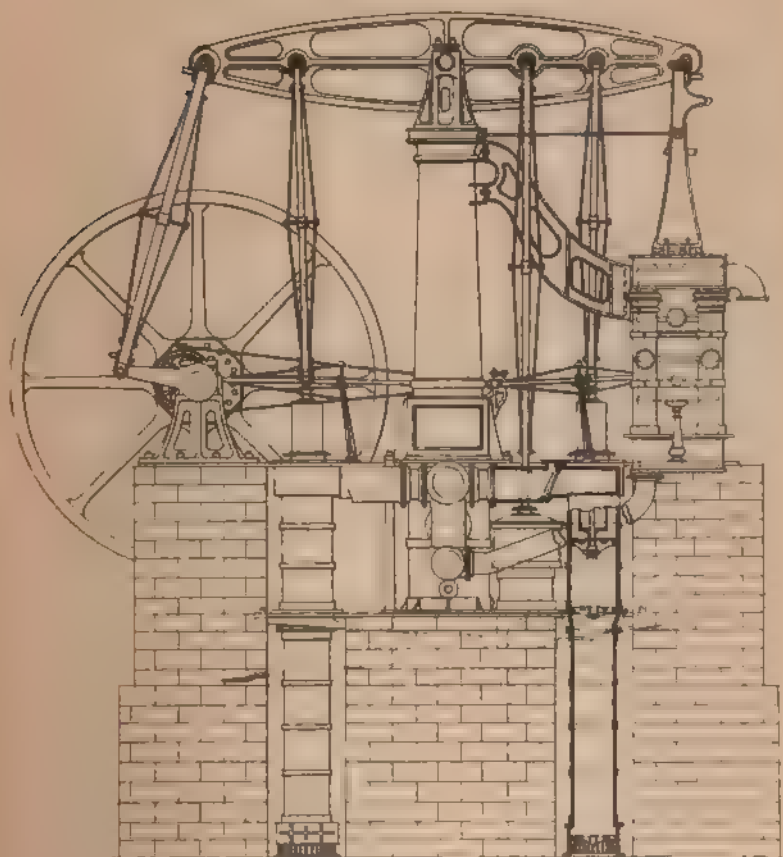
Length of Working Beam 30<sup>ft</sup>

Weight " " " 16 Tons

Diameter of Fly Wheel 24<sup>ft</sup>

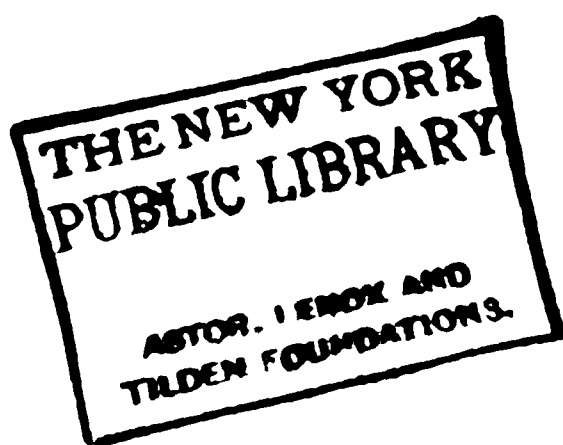
Weight " " " 16 Tons

Cost, Engine & 2 Boilers \$59,000<sup>00</sup>



Scale of Feet.





No III

ERECTED  
1867

DOUBLE ENGINE

Capacity 18 Million Gallons in 24 Hours

Steam Cyl. 44<sup>in</sup> Diam. 8<sup>ft</sup> Stroke

Double Acting - Water Pumps 28<sup>in</sup> Diam. 8<sup>ft</sup> Stroke

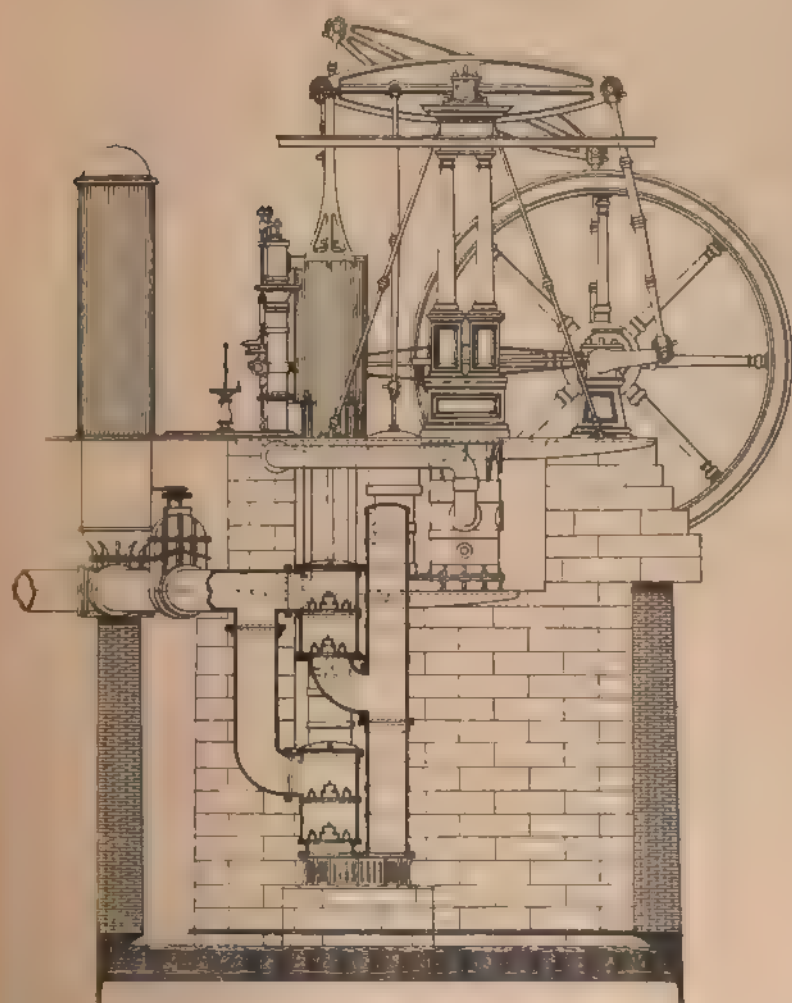
Length Of Working Beams, Each 18<sup>ft</sup>

Weight " " " " 7 Tons

Diameter Of Fly Wheel 24<sup>ft</sup>

Weight " " " " 24 Tons

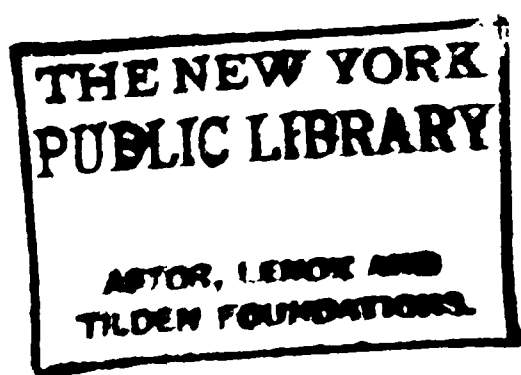
Cost With One Boiler \$112,500<sup>00</sup>



Scale of Feet.



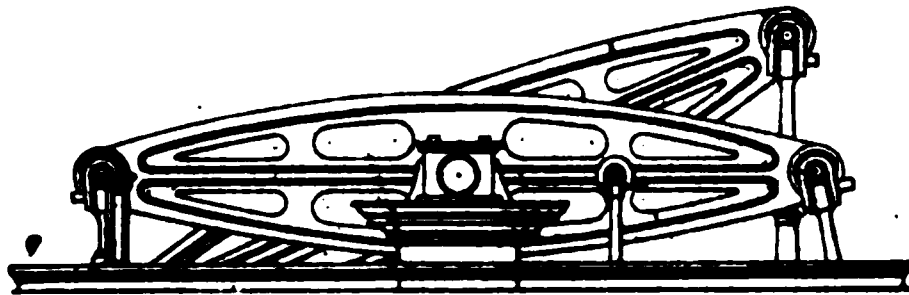




1872

## DOUBLE ENGINE

Steam Cyl. 70<sup>in</sup> Diam. 10<sup>ft</sup> Stroke  
Water Pumps 57<sup>in</sup> " 10<sup>ft</sup> "



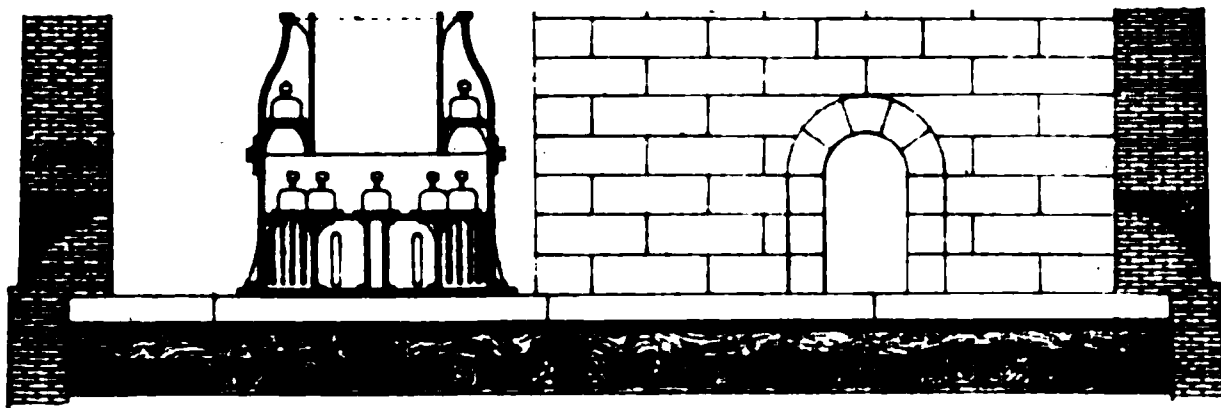
No. IV.

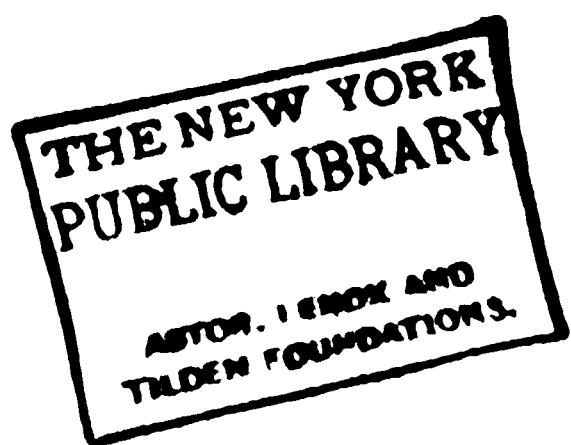
ERECTED

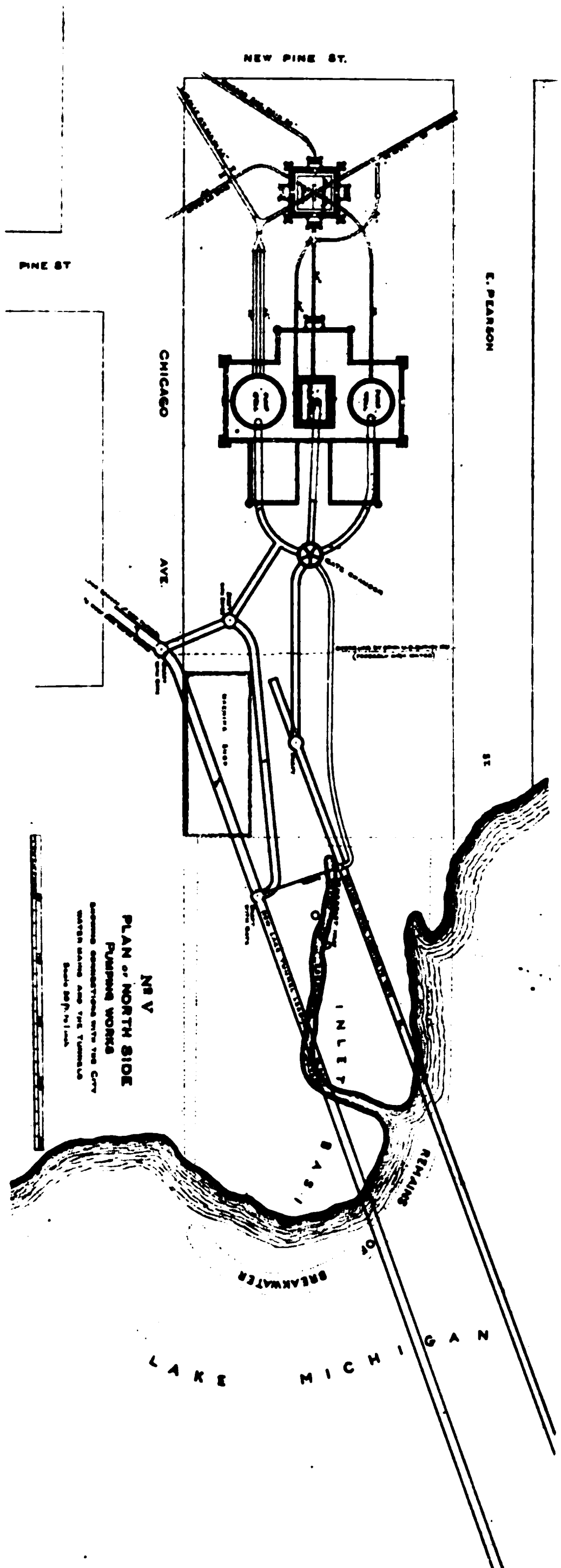
1872,

## DOUBLE ENGINES.

Capacity, 36 million gallons in 24 hours.  
Steam Cyl. 70 in. diam., 10 ft. Stroke.  
Water Pumps, 57 in. diam., 10 ft. Stroke.  
Length of Working Beams, each 28 feet.  
Weight of " " " 20 tons.  
Diameter of Fly Wheel, 26 feet.  
Weight of " " 40 tons.  
Cost, with three Boilers, \$188,400.







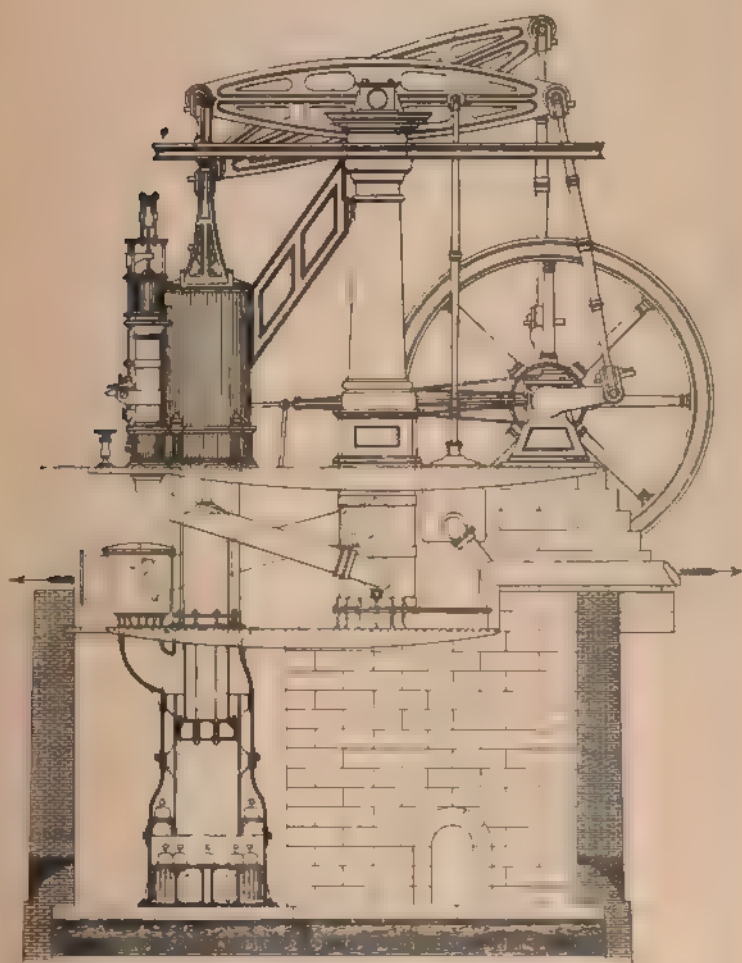
PLAN OF NORTH SIDE  
PUMPING WORKS  
SHOWING CONNECTIONS WITH THE CITY  
WATER MAIN AND THE TUNNELS  
UNDER THE PIER

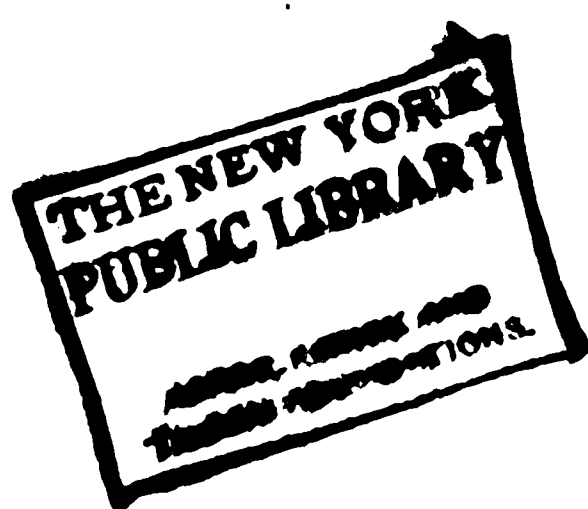


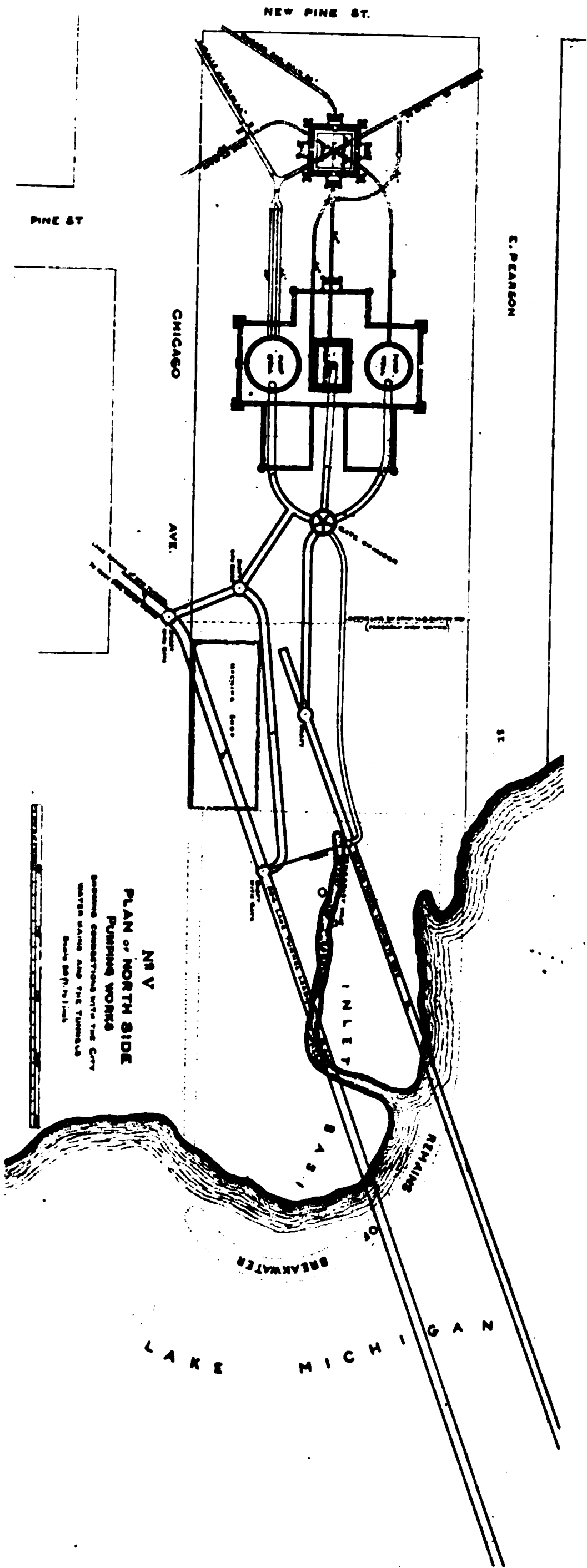
1872

DOUBLE ENGINE

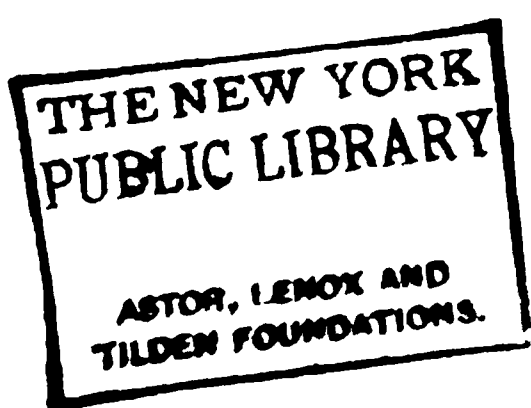
Steam Cyl. 70" Diam 10F Stroke  
Water Pumps 57" " 10F "











No. III. is an elevation of the third engine erected, being a pair coupled together. These engines were put in service in July, 1867, and pumped the first water that was supplied to the city through the first lake tunnel. After pretty constant service for nearly ten years, they are now being fitted with new pump valves, etc., which will render them in excellent condition. The dimensions of the main parts are noted on the sketch.

No. IV. is an elevation of the last pair of coupled engines erected at these works. The dimensions of the main parts are given on the illustration. They commenced to pump for the city November 27, 1872, since which time they have been in use almost constantly, working smoothly, without accident or breakage, and up to the present time, with little more than the repairs incidental to ordinary wear and tear. These engines pumped the first water for the city which came through the second lake tunnel. They are now supplying the city in conjunction with one of the engines at the West Works.

All the engines are supplied with steam from five boilers twelve feet in diameter and twenty feet long. Three of them are located in the south and two in the north boiler room.

No. V. is a plan showing the relative course and connections of the shore end of both lake tunnels, and branches with the gate chamber and pump well; also the direction of the several water mains, from the engines and their connection, to and continuation from the base of stand-pipe in the tower.

I regret to report the death of Mr. Henry R. Ward, who died very suddenly of heart disease, at two o'clock in the morning of the fourth day of September last, while in the discharge of his duties at the works. The deceased was an old employe of this department, an excellent mechanic, and was respected by all who knew him. It affords me a melancholy pleasure to bear

testimony to the uniform energy and faithfulness which characterized the deceased, during a long and unbroken term of service at these works.

Respectfully,

DEWITT C. CREGIER,

*Engineer.*

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### THE WEST SIDE PUMPING ENGINES.

These, according to agreement, were operated by engineers in the employment of the contractors. Mr. Henry Mason had charge of them. The east engine, also called No. 26 by the contractors, was first started Oct. 8, and the west one, also called No. 25, October 10. Owing to the breakage of a thirty inch stop-cock put in by the city, and to necessary adjustments of the engines, they did not begin to run regularly till November 6. Upon the stoppage of the large engine at the North Side Pumping Works for repairs, December 12, both the West Side engines commenced pumping, and continued till the end of the year. A description of them will be found further on in this report.

The following tabular statement shows their operations to December 31.

OPERATIONS OF THE ENGINES AND BOILERS AT THE WEST SIDE PUMPING  
WORKS, FROM NOVEMBER 6, TO DECEMBER 31, 1877.

DATE. 1876	No. of Days		No. of Hours		Average No. of Hours per day.	Total Revolu- tions.	Total number of galls. pumped.	Average No. of Galls pumped per day.	Coal consumed for pumping & heating build- ing.	Average number of pounds of coal consumed per day.	Total amt. of coal consumed for all purposes, inc- ludg fire exp- s- with engines.	Head of water in feet	REMARKS.
	11. 135	12. 40	13. 05	14. 57									
Nov 6 to Nov. 22	16	135	40	12	14	136,492	131,451,680	8,216,730	169,876	10,617	160	Engine 25 running alone.	
" 18 to Dec. 8	17	203	05	11	57	122,188	127,075,520	7,475,030	168,480	9,911	108	Engine 26 running alone.	
Dec. 9 to Dec. 11	2	18	26	9	14	10,166	10,572,640	5,286,320	22,200	11,100	14,261,991	96	Engine 25 running alone.
" 12 to " 31	20	471	18	23	86	266,360	551,693,620	27,598,170	719,600	35,980	113	Both engines coupled together.	
	56	886	81	.....	.....	524,216	821,063,360	.....	1,080,164	.....	14,281,991	.....	

EXPENSES AT THE WEST SIDE PUMPING WORKS DURING  
NOVEMBER AND DECEMBER, 1876.

Salaries and wages .....	\$1,430.44
677 $\frac{1730}{2000}$ tons Lackawanna coal, @\$6.48.....	4,492.56
23 $\frac{380}{2000}$ " Lehigh, " @8.00.....	179.28
53 $\frac{380}{2000}$ " Erie, " @6.00.....	319.14
92 gallons cylinder oil.....	101.20
151 gallons lard oil .....	142.00
Tallow .....	18.81
Packing, gaskets, etc .....	127.50
Sundry expenses . .....	7.78
Gas bills .....	524.70
Repairs .....	45.58
	<hr/>
	\$7,389.49
Less 40 $\frac{500}{2000}$ tons Lackawanna coal on hand Jan. 1,	
1877, @ \$6.48.....	260.82
	<hr/>
Amount .....	\$7,128.67

These items incorporated with the corresponding ones in Mr. Cregier's Report, make the total number of gallons pumped during the year 1876, 15,346,922,158, and the cost of delivery per million gallons \$9 $\frac{517}{1000}$ .

It is hoped that another year there may be an appropriation for improving the grounds around these works, to make them correspond, in some measure, with those around the North Side Pumping Works.

## DESCRIPTION OF THE WEST SIDE PUMPING WORKS.

After much investigation and discussion by the late Board of Public Works, in relation to the merits of different kinds of pumping engines, the discordant views on this subject held by different persons, amongst those supposed to be best informed, led to a determination to advertise for engines that would do the work required, without confining the proposers to any particular type. July 10, 1874, the Board advertised to receive proposals for two pumping engines, with boilers and connections, on foundations to be prepared for them by the city; the engines to work separately or coupled together, and capable, each, of delivering fifteen millions U. S. gallons of water daily, at a height above the surface of the water in the well of one hundred and fifty-five feet, with a consumption of coal not to exceed one hundred pounds for each ninety million pounds of water raised one foot high; the whole to be completed, to the satisfaction of the Board, by the first day of October, 1875, and guaranteed for twelve months by the contractors; at the end of which time, if the engines failed to meet the requirements of the contract, they were to be removed by the contractors, who were to repay to the city the amount of money previously received on account of them. For the performance of all of which they were to give satisfactory security.

The advertisement called forth much criticism, and its stringent terms were strongly condemned by some intelligent and responsible parties who desired to bid for the work. The Board then gave notice, by letters, to such parties, that proposals for what they might think practicable, would be considered. Eight bids from responsible parties were received; of these five had asked for no modification in the capacity or duty of the engines. The lowest for the full conditions required by the advertisement, after much careful inquiry on the part of the Board, during

which they visited eastern and western cities, was not accepted, the Board feeling satisfied it was not for the best interest of the city to do so.

The next lowest bid was that of the Quintard Iron Works, which was accepted, and a contract made with them. This led to an injunction being served to restrain the Board from proceeding with the work under the contract. On the twenty-seventh of January, 1875, the injunction was dissolved. From that time the contractors proceeded regularly with their work, but rather slowly, in consequence of the foundations not being completed until about six months after the time required.

The engines, as completed, are noble machines, handsome in proportions and movements, and without showy ornaments. The longer they are used the more satisfactory does their performance become: so that there is every reason to believe the city and the contractors will have continued cause for congratulation in their success.

On the accompanying plate will be found an elevation of one of these engines. There are two compound condensing beam engines, arranged so that they can be operated together or separately, connection being made by a cast iron coupling, fitted at end of each engine shaft, and fastened together with bolts and keys. High pressure cylinders forty-eight inches diameter, stroke six feet; and low pressure cylinders seventy-six inches diameter, stroke ten feet: Corliss steam and exhaust valves, operated by a central disc or tables, connected with eccentric attached to engine shaft.

Steam chests and passages cast on the cylinders. Both cylinders have air spaces around them, encased first with plaster and ashes, and then with oiled black walnut staves. Piston rods seven and one-half inches diameter. Each working beam composed of two wrought iron plates two and one-half inches thick,

ERECTED 1876

COMPOUND CONDENSING BEAM PUMPING ENGINES

WEST DIVISION WATER WORKS

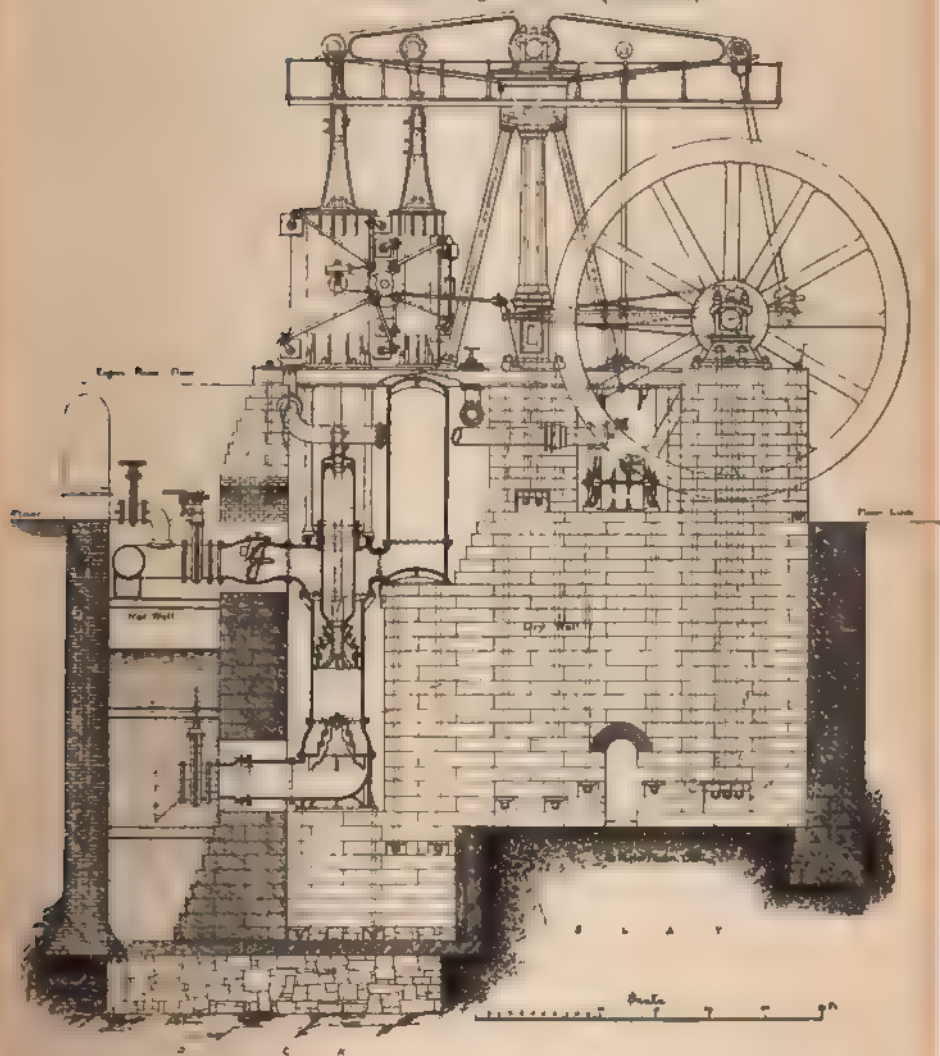
High Pres Cyl 48" Diam 6' Stroke

Low Pres Cyl 76" " 10' " "

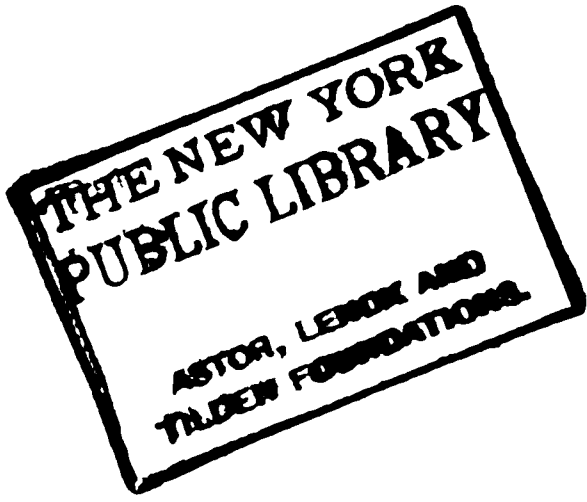
Water Pumps 3' " 10' " "

Guaranteed Capacity 3,000,000 Gall in 24 hours

Cost including 6 boilers \$243,500.







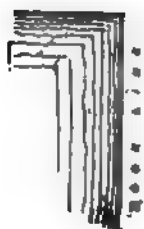
thirty-six feet long between centres of end pins, and seven feet deep at centre. Plates secured fifteen inches apart by cast iron sockets, and bolts running through and through. Hubs for centres wrought iron, counter-bored into and riveted to the plates. Beam pillow-blocks rest upon and secured to a cast iron entablature, supported on two cast iron columns, with four diagonal brace columns. Entablature secured in position by bolts passing down through columns into foundation or engine bed. Bedplate cast iron, in sections bolted together, with faced bearings for cylinders, diagonal columns, base and main pillow-blocks, and secured to the engine foundations with bolts. Each fly wheel of cast iron, thirty-two feet diameter, weight sixty tons. Condenser placed below bedplate, and air pump inside the condenser, hot well being in upper end of condenser castings. Air pump thirty-eight inches diameter, four and one-half foot stroke.

Direct-acting bucket and plunger water pumps underneath low pressure steam cylinders, and connected with them by bolts and columns. Plungers thirty-six inches in diameter, ten foot stroke. Pump chambers fifty-one inches in diameter. Pumps in a dry well, secured at the base by holding-down bolts, let into masonry. Nozzle for suction, three feet in diameter, connected with supply well. Morris foot and bucket valves, consisting of three slotted brass rings of thirty-eight and one-half, twenty-eight and one-half and twenty and one-half inches diameter, cast together, and surrounded by bands of India rubber, secured in position by brass clips. Delivery nozzle from each engine thirty inches diameter, provided with gate valves. Air chambers placed immediately behind pumps, each sixteen feet high, five feet diameter, and connected with pumps by nozzle twenty-four inches diameter. Each engine fitted with screw steam stop valves, throttle valve, and injection valve, and unhooking column. Cast iron gallery around each working beam, connected together, and reached by an iron stairway from engine room floor. Six horizontal return tubular boilers, each six and

a half feet diameter, sixteen feet long, with eighty tubes four inches in diameter, sixteen feet long. Each boiler has a steam drum three feet diameter and eight feet high. Boilers set up in pairs in masonry, have cast iron turnace fronts, and supplied with water by independent steam pumps, connected with hot wells supply well and water mains.

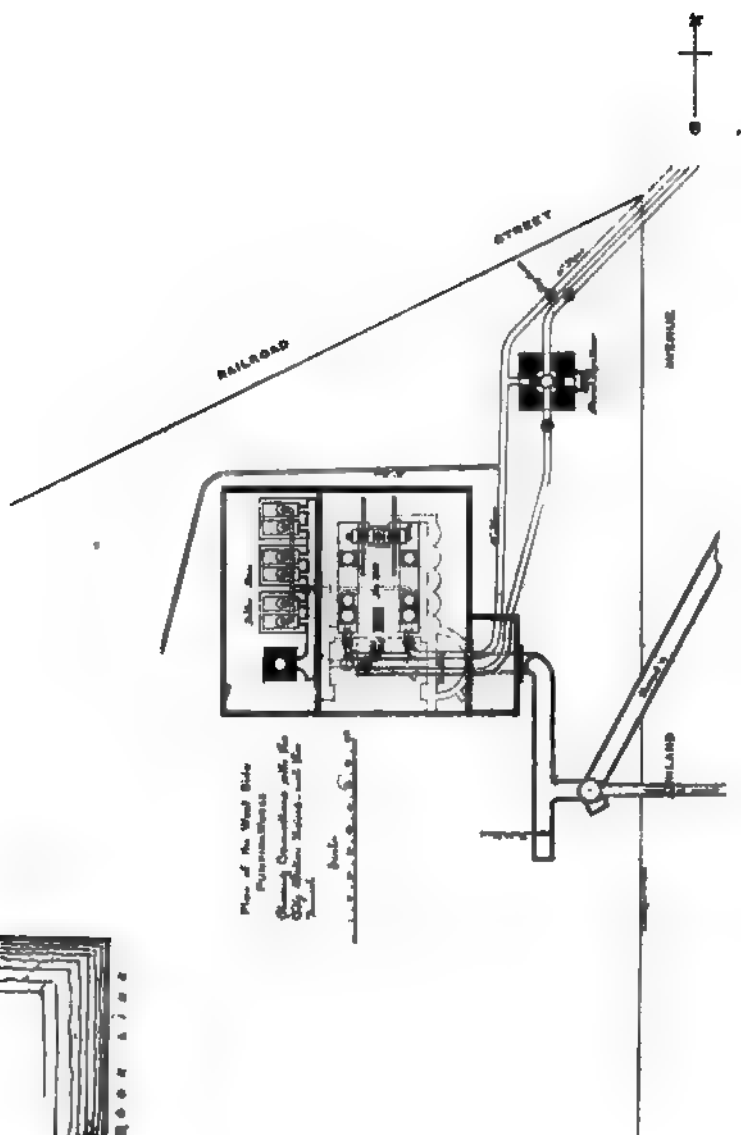
For the contractor, the designing engineer was Mr. A. A. Wilson, and the superintendent of erection, Mr. Henry Mason. The amount of the contract, for engines and boilers, was \$243,500.

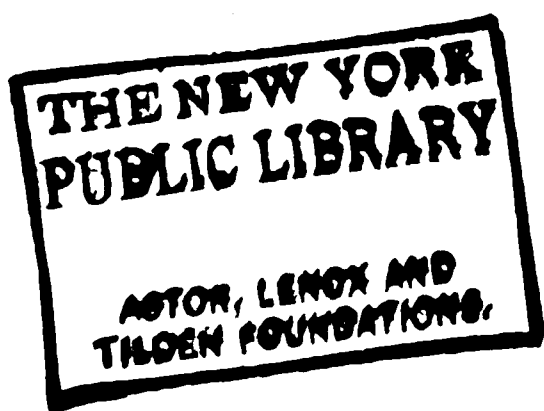
The foundations for the engines and buildings were built by Mr. Wm. D. Cox, the engineer in charge being the late Mr. Wm. Bryson. Foundations include weir well, supply well and dry well, arranged as shown on accompanying plan. The weir well is semi-circular on plan, twenty-six feet diameter. The land tunnel is connected with this well by a branch tunnel seven feet diameter. The supply well is forty-four feet long by ten feet wide, and separated from the weir well by a brick wall, at the bottom of which is a gate five feet by three feet (operated from the basement floor of the building), to admit water to the supply well. Foundations of engines in and under dry well, which allows access to holding-down bolts and bottom of pumps for repairs or other purposes. Foundations built of large sized blocks of stones, the joints and edges dressed and set in cement mortar. The south part and the wells are built on the rock, which is forty-four and one-half feet below the surface of the ground. North part of foundations built on blue clay, twenty-nine and one-half feet below the surface of ground. Foundations of buildings on piles, except west wall of engine-room, which is built on wall of wells, and the south wall, which being temporary, is built on a foundation a few feet below the surface of the ground. Holes for the holding-down bolts drilled after the masonry was completed, with two Ingersoll steam rock



Plan of the Wind Side  
 of the  
 City of New York  
 showing the location of the  
 City of New York  
 and the  
 City of New York

Scale  
 1 inch = 1 mile





drills. There are seventy-four holes for bolts, from six to four inches diameter, some of which are thirty-six and one-half feet long. Drilling was considerably impeded by the breaking off of spawls at joints of masonry.

The engine and boiler-houses are substantially built of brick, and faced with pressed brick and stone trimmings on the fronts. The engine-room is one hundred by sixty-six feet, plastered inside, with sand finish blocked off in imitation of stone. The roof open with trusses of wrought iron, lantern light and ventilators are on the top, and covered with tiles moulded on the under side, having a pleasing appearance. The tiles are laid on flanges of T iron rafters, and covered with slates bedded in cement. The boiler-house, one hundred by forty feet, is covered with galvanized iron on iron trusses. The chimney is one hundred and twenty-five feet high, octagon in plan, and finished with stone cap. On each side the main entrance to the engine-room are offices for the engineers, with sleeping rooms above.

The tower, which is built on the northeast of the main building, is one hundred and ninety feet high from the ground to the top of the masonry, and built square of stone to the height of fifty-two feet, and from thence to the top is octagonal, of brick with stone trimmings and cornices, and surmounted with a plain roof of copper. The inside of the tower is cylindrical, and twelve feet in diameter. The stand-pipe inside of the tower is five feet internal diameter, and one hundred and sixty-seven feet high, and connected to the discharge main from engines with a thirty inch branch pipe on the west side of the tower, with provision for similar connection in the future on the east side.

During the coming season it is intended to lay another thirty-six inch main from the engines to the stand-pipe. When this is done the engines can discharge immediately into separate mains, instead of into the same main south of the stand-pipe, as is done at present.

The engine and boiler-houses and the tower were designed

by Mr. S. G. Artingstall, who also had immediate charge of their erection. The contractors were, for masonry, Messrs. Earnshaw & Gobel; cut stone work, Messrs. Gindele Bros.; tiling and terra cotta work, the Chicago Terra Cotta Company; iron work, the American Bridge Company; painting and glazing, Geo. W. Manning.

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### TESTING OF THE ENGINES.

In January, Messrs. Moses Lane, Chas. H. Haswell, Henry Warrington, Chas. Hermany and Thos. I. Whitman were appointed a commission to test the engines for duty and capacity. They completed their work after sixteen days of arduous and trying labor, but the engines failed to equal the duty, though they exceeded the capacity required of them; the reasons for which are given in the report of the April trial, which is herewith presented. The above named gentlemen so systematized the work of testing the engines at the first trial, however, that it was not thought important to have more than three of them at the second.

REPORT OF COMMISSION FOR TESTING THE  
WEST SIDE PUMPING ENGINES.WEST DIVISION PUMPING STATION, }  
CHICAGO, April 25, 1877. }

The Commission of Engineers, appointed by Mr. E. S. Chesbrough, City Engineer, under authority of his Honor Monroe Heath, Mayor, to test the operation and ascertain the duty of the pumping engines recently erected by the Quintard Iron Works, of New York, met at the office of the City Engineer, on Friday morning, the thirteenth inst., and proceeded to its organization.

After a general discussion of the necessary preliminary preparations and organization of the observers, the form of their records of the elements of operation and results, the following posts of observation and record were decided upon :

## No. 1 ENGINE ROOM.

Counter, steam vacuum, height of water in well and standing-pipe.

## No. 2—FEED WATER.

Volume and temperature.

## No. 3 FIRE ROOM.

Coal and temperature of room.

## No. 4—WEIR.

Hook gauge.

## No. 5—STANDING-PIPE.

Gauges.

Subsequently the board met at the Pumping Station, in consultation with Mr. E. S. Chesbrough, who submitted the following letter, containing his views as to the duration of the test :



DEPARTMENT OF PUBLIC WORKS, }  
CHICAGO, April 13, 1877. }

*Messrs. Moses Lane, Chas. H. Haswell and Henry Warrington,  
Commissioners for testing the West Side Pumping  
Engines:*

GENTLEMEN :—It is expected that the instructions given to the commission for the first test will govern in the present one. It is thought best that but one engine should be tested at a time, and that the duration of the trial of each engine shall not be less than thirty-six hours ; forty-eight hours would be preferred, unless the commissioners should be thoroughly convinced that no possible advantage in the way of greater certainty could be obtained by prolonging the trial beyond thirty-six hours. It is earnestly desired that during the first trial of each engine, the steam pressure at the boiler shall be kept, as near as practicable, to sixty pounds. Should the first trial of the engines now fail to develop a duty of ninety millions, the commissioners are required to make still farther trials, to ascertain what higher boiler pressure, if any, under eighty pounds, will develop that duty.

Very respectfully,

E. S. CHESBROUGH,

*City Engineer.*

The instructions referred to are as follows:

DEPARTMENT OF PUBLIC WORKS, }  
CHICAGO, January 15, 1877. }

*Messrs. Moses Lane, Chas. H. Haswell, Henry Warrington,  
Chas. Hermany and Thos. Whitman, Commissioners for  
testing West Division Pumping Engines:*

GENTLEMEN :—In performing the duties which have been assigned to you, by authority of his Honor the Mayor, you are requested to proceed in accordance with the accompanying extract, which includes all that relates to the test in the specifications and contract.

**"PROPOSALS FOR PUMPING ENGINES.**

OFFICE BOARD OF PUBLIC WORKS, }  
CHICAGO, July 10, 1874. }

"Proposals will be received at the office of the Board of Public Works until 11 A. M., September 16, 1874, for the construction and erection of two pumping engines, together with boilers and connections, on foundations prepared for them by the city. Each engine shall be capable of raising fifteen million U. S. gallons one hundred and fifty-five feet high, in twenty-four hours, the height to be measured from the surface of water in the pumping well, and the quantity to be determined by a weir or other equally reliable mode. The engines, including all their running parts and railing, shall not occupy a space greater than fifty by thirty feet, on the floor of the engine-house. They shall be perfect of their kind, with regard to forms and proportions of parts, materials and workmanship, without useless ornament or unnecessary bright parts. They shall be free, as a whole, and in all their parts, from all that has not been proved, by actual use, by well known and disinterested witnesses, to be safe to adopt. The boilers shall be uniform in size, material and construction, three in number, two of which shall be sufficient to supply the steam required, and shall stand the government test for strength.

"The engines are to be operated, for one year after erection, by a chief and assistant engineers, appointed by and at the cost of the contractors.

"The engines are to run continuously, day and night, seven days in the week, and at rates of speed (within the limits of the requirements herein specified) according as the Board of Public Works shall direct. The city will furnish for fuel, Pennsylvania anthracite, of as good quality as is ordinarily procurable in the market.

"At such times during the year as the Board may determine, trials of the engines shall be made by such experts as the Board may appoint. The experts to be men of acknowledged impartiality and distinguished ability with regard to matters of the kind.

"In making any one trial, the time occupied may be six consecutive days, of twenty-four hours each. No deduction from the weight of coal consumed shall be made for ashes or clinkers in the estimate of duty. The duty to be required is ninety million pounds of water raised one foot high, with one hundred pounds of coal, besides overcoming the friction of all parts of the engines, pumps, and connections with the water main.

"During such trials as the Board may order, the contractors' engineers shall perform every operation connected with the running of the engines, to the satisfaction of the experts appointed by the Board. The experts shall be allowed to make thorough examinations of all parts of the engines, boilers and connections at such times as they may think best, and to do whatever else they may think necessary to determine, beyond all doubt, the capacity and duty of the engines.

"The pressure of steam on the boilers shall not at any time be greater than sixty pounds to the square inch."

These instructions and extracts from the proposals, as the commissioners understand them, require that the capacity and duty of the engines only are to be ascertained by the test: or in other words, that the following questions are to be answered from the data furnished by the observations of the test, viz :

1. Can the engines pump each fifteen million U. S. gallons of water in twenty-four hours ?
2. Can the engines elevate this quantity of water one hundred and fifty-five feet high ?
3. Can the engines pump this quantity of water and develop

a duty of ninety million pounds of water raised one foot high, with one hundred pounds Pennsylvania anthracite coal, of as good quality as is ordinarily procurable in the market?

Whereupon it was decided that each engine should be operated for a period of thirty-six hours, under a steam pressure of sixty pounds per square inch, with all practicable uniformity, and that one of the engines should be operated for a period of twenty-four hours under a pressure of from sixty-five to seventy pounds, in accordance with the request of the contractors, should such operation be considered necessary to develop the required duty.

The scales for weighing the coal to be consumed were verified by Mr. Fairbanks, enclosed and sealed, and the several steam and water gauges in connection with the engines and boilers and standing-pipe, compared with a testing instrument, and all differences duly noted and registered.

The following elements, in connection with an observation of the results, were then ascertained, viz :

Height of standing-pipe above <i>datum</i> .....	166.74 feet.
Width of weir.....	7.94 "
Height of water pressure gauge at engine above <i>datum</i> .....	28.5833 feet.
Leak in conduit to weir for the period .....	13,736.8 gallons.
Leak through gate to the main for the period.	29,407.8 "

At 11 A. M. on the 18th inst., the test of the west engine was commenced, and in the afternoon it was decided to continue it until 11 A. M., of the 20th, making a period of forty-eight hours.

The float-gauge was constructed by the introduction and projection of a small pipe into the main, with a closed end and an opening in its side, set with its face toward the current of the water, and then connecting with a pipe of one and five-tenths

inches diameter, leading near to the summit of the standing-pipe, and into an enlarged receiver; the whole length of the pipe being fully two hundred and sixty feet.

At 11 A. M. on the 20th inst. the test was concluded, and, upon a summary of the observations as recorded and signed by the observers, the following elements of operation, as averaged for the entire period of the test, were deduced, viz:

Height of water upon the weir, as corrected for the velocity of approach, computed at .0021 .....		.9787 feet.
Height of water in standing-pipe as determined by a float- gauge .....	156.95 feet.	
Height of water in pump well above datum .....	1.12 "	
	<hr/>	155.83 feet.
Height of water in standing-pipe as determined by pressure- gauge at delivery to main.	63.82 lbs.	
Less depth of water in well...	.48	
	<hr/>	63.34
Add elevation of location of gauge above datum, 11 ft. $\div$ 2,306= .....	4.77	
	<hr/>	68.11
Pressure of steam in boilers....		61.77 lbs.
Pressure of steam at engine....		59.25 lbs.
Coal consumed (Lackawanna).		42,400. lbs.
Revolutions of engine per min.		11.177
Vacuum .....		12.83
Volume of feed water per hour at temperature of 124.4°.		9,779.5 lbs.

Temperature of external air . . .	45.9°
Temperature of engine-room . .	75.°
Temperature of boiler-room . . .	77.°

The leaks in the weir-box and through the stop-gate from the main weir, measured and computed at 5,768 cubic feet.

## COMPUTATION OF CAPACITY AND DUTY.

### CAPACITY OF WEST ENGINE.

Volume of water discharged over weir for the full period of forty-eight hours :

$$\begin{array}{rcl}
 3.33 \times .9787\frac{1}{2} (7.94 - .24 - .9787) \times 17200 & = & 4,314,920 \text{ cubic ft.} \\
 \text{Leakage of weir-box and stop-gate . . . . .} & & 5,768 \text{ " } \\
 & & \hline
 & & 4,320,698 \text{ " }
 \end{array}$$

Equal to 32-320,900 gallons, or at the rate of 16,160,470 gallons in twenty-four hours.

### DUTY.

Volume of water pumped for the period, 4,320,698 cubic feet. Hence  $\frac{4,320,698 \times 62.5 - 4 \times 155,83}{42,400} = 990,883$  lbs. water raised one foot in height with one pound of coal, is equal to the raising of 99,083,300 pounds with one hundred pounds of coal, a duty of 99,083,300 foot pounds.

The second test, or that of the east engine was commenced at 9 A. M., on the 20th, and continued until 9 A. M. of the 22d inst.

The following elements of operation for this period were deduced, viz:

Height of water upon the weir, as corrected for the velocity of the approach, computed at .0019.....		.9543 lbs.
Coal consumed.....	43,028	"
Height of water in standing pipe, as determined by a float gauge.....	160.05	
Height of water in well .....	.94	
	159.11	
Height of water in standing-pipe, as determined by pressure-gauge at delivery to main .....	64.91	
Less depth of water in well in lbs.....	.40	
	64.51	
Add elevation of location of gauge above datum .....	4.77	
		69.28
Pressure of steam in boilers .....		60.86
Pressure of steam at engine .....		60.25
Coal consumed (Lackawanna).....	43,028	lbs.
Revolutions of engine per minute.....		10.63
Vacuum .....		12.77
Volume of feed water per hour at temperature of 131°.....		10,059.4 lbs.
Temperature of external air.....		60.75
Temperature of engine-room .....		77.94°
Temperature of boiler-room.....		73.°

COMPUTATION OF CAPACITY AND DUTY.

CAPACITY OF EAST ENGINE.

Volume of water discharged over weir for the full period of forty-eight hours :

$3.33 \times .9543\frac{1}{2} (7.94 - .2 \times .9543) \times 17,280 = 4,157,580$  cubic ft.  
 Leakage of weir and stop-valve..... 5,768 "

Equal to 31,143,940 gallons, or at the rate of 15,571,970 gallons in twenty-four hours.

## DUTY.

Volume of water pumped for the period, 4,163,348 cubic feet.  
 Hence,  $\frac{4,163,348 \times 62.5 - 4 \times 100}{43.20} = 960,668$  pounds of water raised one foot in height with one pound of coal, is equal to the raising of 960,668 pounds with one hundred pounds of coal, or a duty of 96,066,800 foot pounds.

Under the requirements of the contract referred to in your instructions for the first test of these engines, and to which you refer us, we submit:

1. That the engines can each raise 15,000,000 U. S. gallons of water in twenty-four consecutive hours.
2. That the engines can elevate this volume of water one hundred and fifty-five feet in height.
3. That the engines can pump this volume of water, and develop a duty of 90,000,000 pounds of water raised one foot in height with one hundred pounds of Pennsylvania anthracite coal of as good quality as is ordinarily procurable in the market.

In conclusion, we refer you to the preceding computations, from which it is shown that the engines not only pumped and raised the required volume of water, but attained both a capacity and duty very much in excess of that required by the contract; and in addition thereto we submit the following principal dimensions of the engines and boilers :

Diameter of high pressure cylinders.....48 inches.  
 Stroke of piston..... 6 feet.  
 Diameter of low pressure cylinders.....76 inches.  
 Stroke of piston.....10 feet.



Diameter of pumps (Thames Ditton).....51 inches.

Diameter of plungers.....36 inches.

Stroke of plungers.....10 feet.

Diameter of fly-wheels.....32 feet.

Weight of fly-wheels.....69 tons.

BEAMS—Two wrought iron webs, each  $2\frac{1}{2}$  inches in thickness  
by 7 feet in depth and 36 feet in length.

BOILERS—Six cylindrical fire tubular, 6 feet 6 inches in diameter and 16 feet in length.

Double furnaces each 6 feet 6 inches by 7 feet.

Steam Drums, 3 feet 6 inches in diameter and 8 feet in height.

If the question should be asked why it is that the duty at this test so far exceeds that of the former, we submit the following essential elements of comparison :

1. The coal was of a better quality.
2. The boilers were cleaned instead of being partially filled with deposits.
3. The manner not only of firing, but of not resorting to the artificial draught of a steam jet.
4. The engines acting independent of supplying the city, operated with a more uniform supply of water and attained a more uniform head of delivery.

We submit herewith all the observations and notes made at the test of both engines, together with a number of cards of indication.

Respectfully submitted,

(Signed),

MOSES LANE,  
CHAS. H. HASWELL,  
HENRY WARRINGTON.

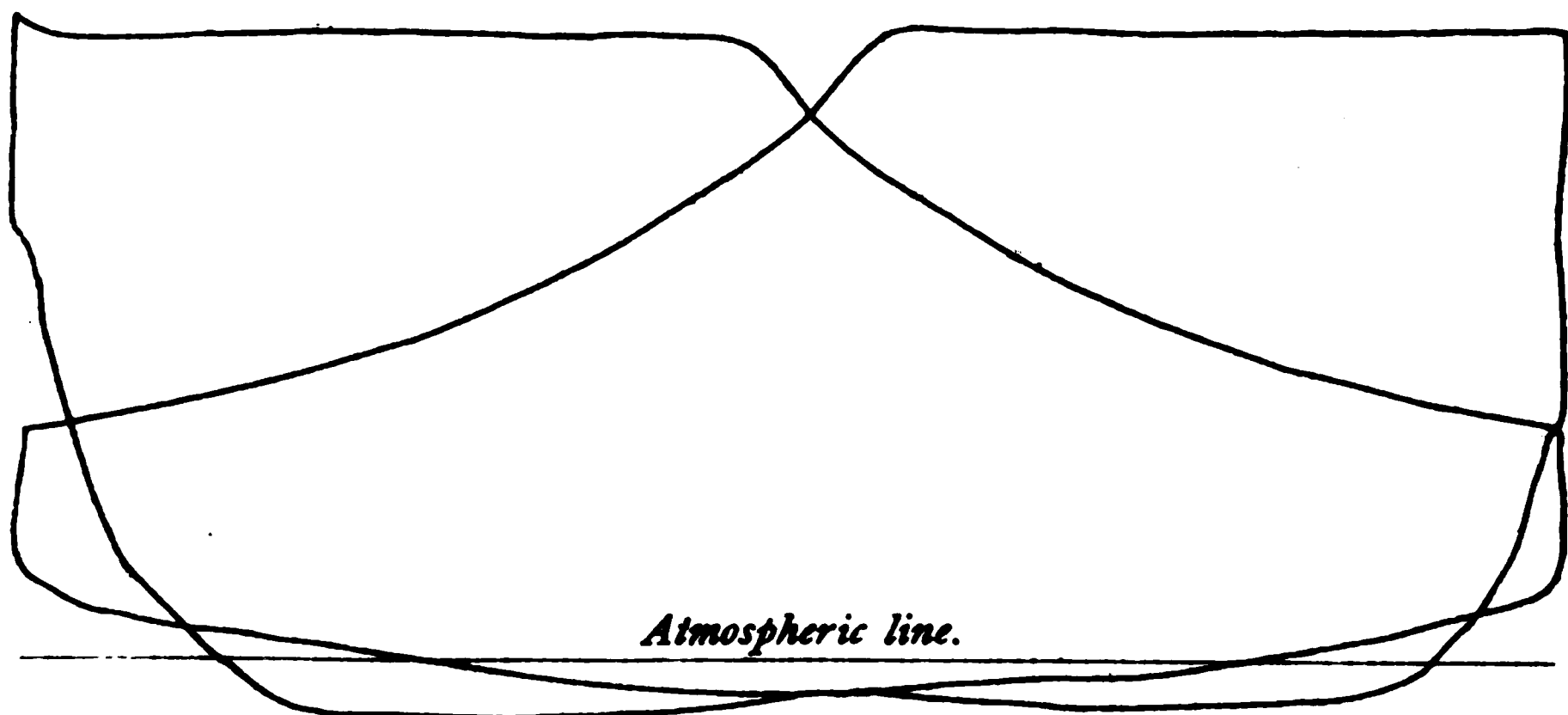
The undersigned concurs in the preceding report in all but the omission of an estimate and computation of the friction due

*Engine 26. April 21st, 1877. 4:58 p. m.*

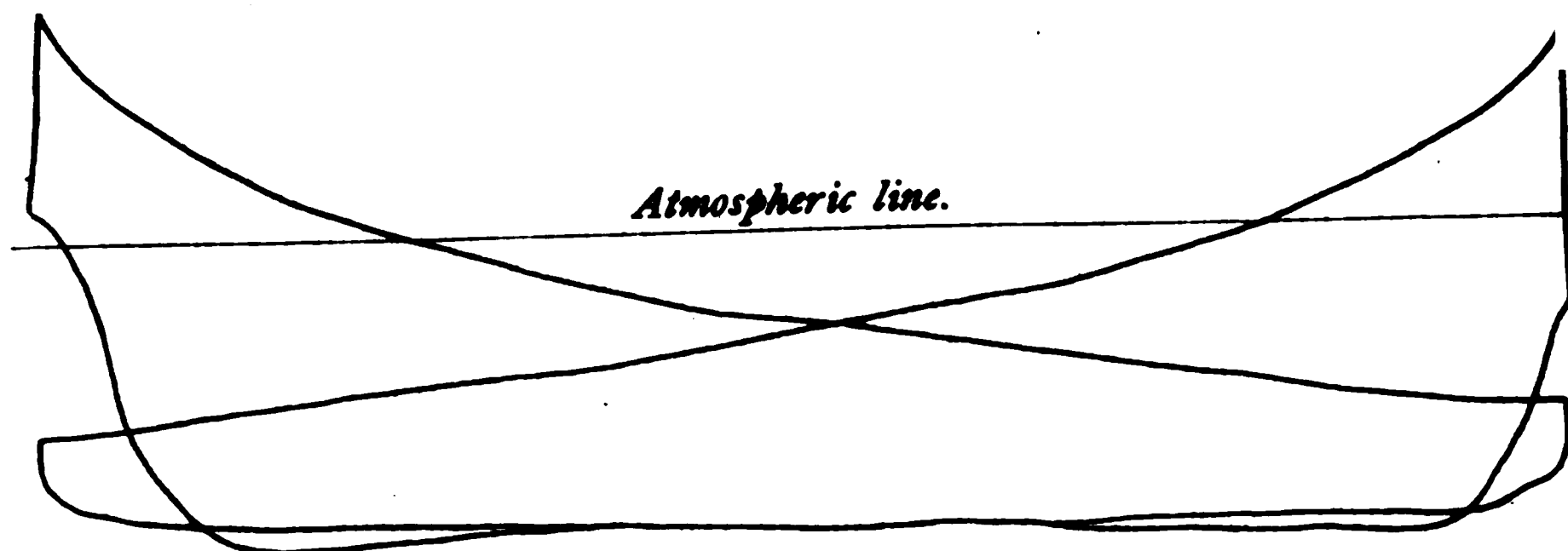
*Steam 60 lbs. Vacuum  $12\frac{3}{4}$ .*

*Revo. 11 per minute.*

*High pres. Cylinder. Scale 30 lb. to the inch.*



*Low pres. Cylinder. Scale 12 lbs. to the inch.*





**DIAGRAM from WATER PUMP between BUCKET and FOOT VALVE.**

*Indicator 11.579 feet below datum.*

*Revolutions 11.*

*Water pres. 11 Gauge feet above datum-64 lbs.*

*Ht. of water in well  $\frac{7}{10}$  feet above datum.*

*Engine 26. 21st Apl., 1877. 4:58 p. m.*

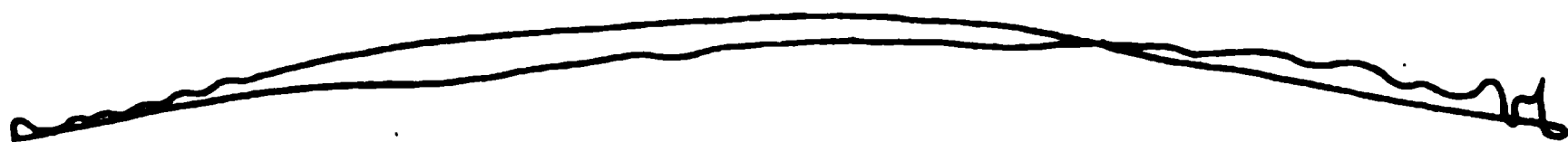


*Scale 56 lbs. to the inch.*

*Atmospheric line.*

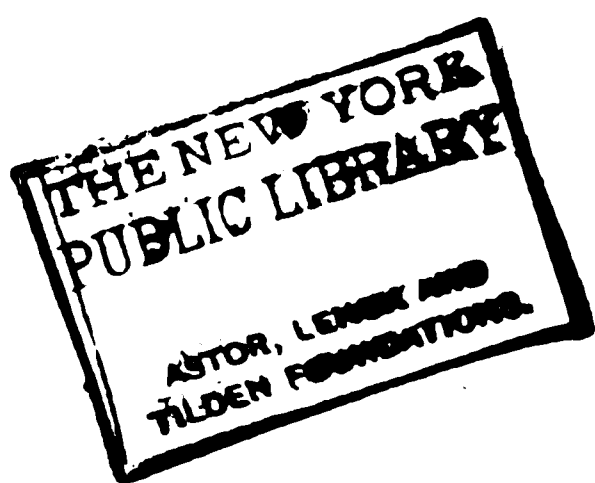
*Diagram from head of water pump.*

*Indicator 3.016 feet above datum.*



*Scale 56 lbs. to the inch.*

*Atmospheric line.*



to the flow of the water through the main and its connections, and into the weir basin and standing-pipe; as evidenced by the gauge at the main, which, including its elevation above the level of the water in the well, indicated a mean pressure at the second test of 69.7 pounds, or a head of 161-01 feet in lieu of 159.11 feet as computed.

The difference for the first test is not included, in consequence of a deficiency in some of the readings of the gauge at the commencement.

(Signed,)

CHAS. H. HASWELL.

E. S. CHESBROUGH,

*City Engineer.*

## CONSUMPTION AND WASTE OF WATER.

This subject was so often presented to the city council by statements, arguments and expostulations in the reports of the late Board of Public Works, that it would seem almost useless to bring it up again ; but whatever may be its triteness, its importance to the public is so great and so urgent that it cannot be overlooked. The following table presents this and some other relative matters in the most condensed form practicable.

# TABULAR STATEMENT OF THE CONSUMPTION AND WASTE OF WATER.

[illegible]



This table shows that the rate of annual increase in the consumption of water by the whole city has materially diminished during the last two years, but the rate of increase of population has diminished still more, so that the average quantity of water supplied to each inhabitant is greater than ever before. This reckless waste not only adds largely to the public burdens but threatens to increase in force from year to year serious inconveniences felt already by water takers in many parts of the city, especially during very cold or very warm weather, or when the most powerful pumping machinery may be out of order.

The present machinery and water pipes are much more than sufficient to supply the city with all legitimate demands for domestic and manufacturing purposes; but if such waste as now takes place must not only continue but increase, then either the expenditures of the water department must be greatly increased or there must be frequent (and at times great inconvenience in many parts of the city from a short supply, besides the disastrous consequences that might occur in case of a great fire.

How to remedy this state of things is a problem that has perplexed other and older cities. At first sight nothing appears plainer than that the universal application of meters would accomplish in the use of water what has been done in the use of gas. Reasoning on the subject only confirms this opinion, yet there are serious practical difficulties in the way, among which are the first cost and the subsequent maintenance of so many meters. At present these would indeed be serious objections in Chicago. It may also be stated that as yet it is not known that any important modern city in the world disposes of one-half of its water supply by measure. Ancient Rome sold water to the citizens by measure, but their public aqueducts and private arrangements differed materially in some respects from those of modern cities.

The city of New York undertook a few years since to settle this question by the general introduction of meters, for which

a large contract was made; but the plan has never been carried out. It is understood now that the plan itself is less favorably looked upon by the authorities.

In the present circumstances of Chicago, the only practicable course to pursue seems to be,

1. To continue to appeal to the public conscience.
2. To continue the examination of the premises and outlets of water takers, by faithful and discreet inspectors.
3. The impartial and steady enforcement of the rules already adopted against waste.
4. Constant care to be informed of all improvements in this respect made by other cities.

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### QUALITY OF THE WATER.

The water supplied to the city, though occasionally turbid in consequence of storms on the lake, was uniformly good in character, except during the freshet of the first week of April, when, for a time, the South Branch at Ashland avenue, stood eight feet above city datum, or five and a half feet above the average level of the lake for that month. During this freshet the water supplied to the city was worse than at any other time since the completion of the tunnels, and the physicians attributed a marked increase of bowel affections to this cause. Fortunately very few cases proved fatal, and the water resumed its wonted purity in about a week.

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### INLET BASIN.

This has been of no use in supplying water to the city for several years, and may never be again, unless some disaster

E

should happen to, or at the crib. Its form and size will be seen on the general plan of the North Side Pumping Works. It was originally enclosed by two substantial rows of piles, with stone filling between on the lake side, and dredged out within to a depth of twelve to fourteen feet. The piles above water are now very much decayed, the stones have been leveled with the lake, and the basin is filled up with sand and gravel.

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## RESERVOIRS.

There were formerly three of these; one in each division of the city. Only one, that on the West Side, is used at all now. (*See next article below.*) They were wrought iron tanks, sixty feet in diameter, twenty-eight feet high, and rested upon stone and brick masonry, so that their tops were about eighty feet above the lake. They contained each about half a million gallons.

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## WATER PIPE OR DISTRIBUTION SYSTEM.

A summary showing the extent to which the city has been provided with water pipes, will be found at the end of the list of those laid in 1876.

The system as it now exists is not the result or carrying out of any definite plan formed in the beginning, for no one then knew how rapidly the city would grow, in what directions the greatest increase would take place, nor what would be the demand for water in proportion to the population. All these have greatly exceeded the views of the first projectors of the works as will be seen by the table under the head of "Consumption and Waste of Water."

The original system of distribution consisted of a twenty-four inch force main extending from the North Side Pumping Works to North State (then Wolcott) street. From this point a sixteen inch branch passed along State street to Ontario, and was there reduced to twelve inches in diameter. Thence it continued this size to the river, under which it passed after being enlarged to a thirty inch (boiler iron) pipe, to accommodate large pipes each way some future day; thence a twelve inch cast iron pipe to Adams street, on State, thence along Adams to the South Reservoir; thence further along Adams street and under the South Branch by a wrought iron pipe and along West Adams street to Union street; thence north to Monroe street. On Chicago avenue a sixteen inch pipe was continued westward, connecting with the North Reservoir on the south-west corner of Sedgwick street, and crossing the North Branch by a wrought iron syphon pipe, to Union street; thence southward along Union street to Monroe street, where it united with the twelve inch pipe from the South Reservoir, and thence along Monroe street to the West Reservoir.

The South Reservoir (S. E. corner Adams and LaSalle streets), was for many years the centre of distribution for the South Division; but since the great fire of 1871, it has ceased to be of any importance whatever to the water pipe system of the city.

The West Reservoir, on the S. E. corner of Monroe and Morgan streets, was considered for a long time the main point of distribution for the West Division, south of Kinzie street. To-day, however, though still in use, this Reservoir might be dispensed with and its loss scarcely felt, if at all, by any part of the city. Unless the pipes leading to and from it were throttled almost to stoppage it would overflow very often, especially during the night. The North Reservoir was more difficult to keep from overflowing than the west or south. Since the great fire

it has been of no service whatever, except as a storehouse of articles used in water pipe extension and repairs, and this simply as a convenience, not a necessity.

The distributing pipes which then consisted of 10, 8, 6, 4 and 3 inch ones, were connected with each other at all their crossings, and this system, which gives great advantage in case of fire, has been continued to the present.

The increase of population and consequent growth of the city and the greatly increased height and value of buildings in its business portions have demanded a greatly increased capacity for furnishing water. The laying of three inch pipes was discontinued nearly twenty years ago and, except for courts or alleys, or temporary purposes, the policy now is to lay no more 4 inch pipes.

A system of 36 inch and 24 inch force mains exists now between the old and new Pumping Works, extending along Pine street and Wabash avenue on the east, Eighteenth street, Canalport avenue and Twenty-second street on the south: Ashland avenue on the west, and Division, Crosby, Oak and Rush streets on the north. Besides this, a 36 inch force main has been laid from the old works along Rush, Superior and LaSalle streets to Adams street, passing through the LaSalle street river tunnel, under the foot way. This main is connected with the general distribution at State, Ontario, Lake, Washington and Adams streets, and is to be shortly at Michigan street. More frequent connections were not thought judicious with the main artery of the city, lest the necessity for shutting off the supply through it should become dangerous in case of fire, and exceedingly inconvenient at other times. As the number of the principal and cross mains increases, the objection to frequent connections with the former diminishes, consequently many more are now made. The completion of the grand circuit above described permits such connections to be made with far less inconvenience to most

parts of the city than formerly. A 36 inch main has already been laid from Twenty-second street along Throop and Main streets to Archer avenue, passing under the South Branch through a tunnel; thence it is to be continued to Thirty-first street, and thence along that street to Wabash avenue, thus completing a grand circuit, four miles in extent from north to south and two miles from east to west.

### WATER PIPES.

A much smaller amount of water pipe was laid than usual during the past year, and a large proportion was of greater diameter than 6 inches, showing a continued regard to fire protection. The table below gives their sizes, lengths and localities.

### DISTRIBUTING PIPES.

There were laid during the year ending December 31, 1876, the following main and distributing pipes, viz :

#### SOUTH DIVISION.

ON WHAT STREET.	BETWEEN WHAT STREETS.	Length in feet.	Diameter in inches.
Archer av .....	Halsted st and the south branch.....	5,507	12
Archer av.....	Across Pitney av. ....	108	8
Archer av .....	In connection at end of 12 inch pipe.....	26	8
Archer av .....	In connection at intersecting streets.....	96	6
Archer av .....	Main st. and westward .....	12	24
Archer av .....	Main st and westward.....	46	6
Arch st.....	Archer av. and southward.....	134	8
Broad st.....	Across Archer av. ....	112	8
Bonfield st.....	Archer av. and northward .....	45	6
Church st.....	Archer av. and northward.....	76	6
Cologne st.....	In connection at Main st .....	24	8
Dearborn st.....	Twenty-fourth and Twenty fifth sts .....	630	6
Eldridge ct .....	State st. and Wabash av. ....	315	8
Amount carried forward.....		7,131	

**FIRST ANNUAL REPORT OF**  
**SOUTH DIVISION—Continued.**

ON WHAT STREET.	BETWEEN WHAT STREETS.	Length in feet.	Diameter in inches.
	Amount brought forward.....	7,181	
Farrel st.....	Archer av. and southward .....	90	6
Halsted st.....	Archer av. and northward.....	88	8
Hough pl.....	Archer av. and northward.....	86	6
Joseph st.....	Archer av. and northward.....	15	6
Keeley st.....	Archer av. and southward .....	70	6
Lime st.....	Across Archer av ... ..	186	8
Lock st.....	Archer av. and southward.....	76	12
Lock st.....	Archer av. and southward.....	48	8
Michigan av.....	Jackson and Van Buren sts.....	472	8
Mary st....	Across Archer av.....	116	6
McDermott st.....	Archer av. and northward.....	40	6
Main st.....	"South branch" and Archer av.....	1,778	36
Main st.....	For blow-off in W. P. tunnel.....	48	8
Main st.....	In connections at Archer av.....	136	6
Nineteenth st.....	In connections at Grove st.....	36	6
Pitney av.....	Across Archer av.....	194	6
Quarry st.....	In connections at Archer av.....	66	6
Quarry st.....	Archer av. and northward.....	86	8
Quinn st.....	Archer av. and southward .....	40	6
Thirty-fourth st.....	Wabash av. and eastward.....	175	6
		10,821	
	Hydrants .....	405	
	Total.....	11,226	

**WEST DIVISION.**

ON WHAT STREET.	BETWEEN WHAT STREETS.	Length in feet.	Diameter in inches.
Adams st .....	Irving pl. and Oakley ave.....	263	6
Ashland av.....	Kinzie st. and northward.....	8	24
Ashland av.....	In connections at Twenty-second st .....	42	24
Ashland av.....	Twenty-second st. and southward into new pumping works.....	996	36
Ashland av.....	To blow-off at new pumping works.....	80	8
*Blue Island av.....	For viaduct approaches.....	83	6
*Blue Island av .....	For viaduct approaches.....	264	4
Blue Island av .....	In feeder connect'ns at Twenty-second st..	52	8
Campbell av.....	Lake st. and southward.....	200	6
Curtis st.....	Fulton st. and southward.....	100	6
Chicago av.....	Hoyne av. and Robey st.....	709	6
City pipe yard.....	Putnam st. and eastward.....	100	4
Carroll av .....	Francisco st. and westward.....	490	4
*Desplaines st.....	For viaduct approaches .....	712	6
Elizabeth st.....	Across Fulton st.....	90	6
Fulton st.....	Sangamon st. and westward to connect....	2,680	8
Fulton st.....	Halsted st. and eastward.....	40	6
	Amount carried forward.....	6,859	



## WEST DIVISION—Continued.

ON WHAT STREET.	BETWEEN WHAT STREETS.	Length in feet.	Diameter in inches.
	Amount brought forward.....	6,859	
Francisco st .....	Fulton st. and Carroll av. ....	400	8
Hoyne av.....	Lee pl. and Iowa st .....	940	8
*Hubbard st.....	For Milwaukee av. viaduct approaches....	250	6
Iowa st .....	Hoyne av. and Robey st.....	670	6
*Kinzie st.....	Jefferson and Union sts.....	745	6
*Lafin st.....	Blue Island av. and southward.....	84	6
*Loomis st.....	Blue Island av. and southward.....	96	8
*Milwaukee av.....	Union and Desplaines sts.....	990	6
Maplewood av .....	Lake st. and northward.....	130	6
May st.....	Fulton st. and southward.....	100	6
Nineteenth st.....	Blue Island av. and eastward.....	66	8
Norton st.....	Polk st. and southward .....	48	6
New pumping works...	In stand-pipe connections.....	216	36
New pumping works...	In stand-pipe connections.....	18	30
New pumping works...	In stand-pipe connections.....	144	16
New pumping works...	In supply of buildings, hydrants, etc ....	324	4
Oakley av .....	Across Washington st.....	168	6
Oakley av .....	Monroe and Madison sts.....	400	4
Ogden av.....	Twelfth st. and southward.....	592	6
Robey st .....	Iowa st. and Chicago av.....	709	6
Rice st.....	Hoyne av. and Robey sts.....	670	6
Rebecca st.....	Throop st. and westward.....	84	6
Sangamon st.....	Fulton st. and northward.....	40	8
W. Thirteenth st .....	Wood and Lincoln sts.....	666	6
Twenty-first st .....	Blue Island av. and eastward.....	66	6
Twenty-second st.....	Ashland av. and westward.....	24	24
Throop st .....	In W. P. tunnel and shafts.....	398	36
Throop st.....	W. P. tunnel and northward.....	209	36
Throop st.....	Madison and Washington sts.....	500	4
Walnut st.....	Kedzie av. and Albany st.....	660	4
		17,266	
	Hydrants .....	1,026	
	Total.....	18,292	

NOTE.—Lines of pipe marked thus \* were rendered necessary by the construction of the Blue Island avenue and the Milwaukee avenue viaducts.



FIRST ANNUAL REPORT OF  
NORTH DIVISION.

ON WHAT STREET.	BETWEEN WHAT STRFETS.	Length in feet.	Diameter in inches.
Astor st.....	Goethe and Banks sts.....	412	8
Clark st.....	Kinzie and N. Water s's.....	270	4
Dearborn st.....	Michigan st. and southward.....	68	6
Fullerton av .....	Hurlbut and Larrabee sts.....	875	4
N. Water st .....	Pine and Seneca sts.....	840	12
N. Water st .....	Seneca st. and eastward.....	1,890	8
Pumping works.....	in connection of well chamber.....	48	24
St. Clair st.....	N. Water st. and northward....	100	8
Wisconsin st.....	Larrabee st. and eastward.....	100	t
		4,098	
	Hydrants .....	851	
	Total.....	4,449	

The whole length of pipe laid in the city during the year was 33,967 feet, being a little less than six and a half miles.

PIPES TAKEN UP AND ABANDONED.

The following is a list of the pipes which during the year were taken up out of the ground, or abandoned as not being worth the cost of taking them up, where larger ones were laid, viz :

Taken up or Abandoned.	LOCATION OF. PIPES.	Length of Feet.	Diam. in inches.
Taken up	Fulton st., bet. Sangamon and Ann.....	1,650	4
*    “	Kinzie st., bet. Jefferson and Union.....	745	6
Abandoned	Michigan av., bet. Jackson and Van Buren.....	472	8
	Total.....	2,867	

\*This was rendered necessary by the construction of the Milwaukee avenue viaduct.

The total length of pipes laid and in use at this date, as nearly as can be ascertained is as follows, viz:

					Lineal Feet.
24	inch wrought iron syphon pipe, at Twelfth street,				258
36	" cast	" main	"		24,511
30	"	"	"	"	18
28	"	"	"	"	160
24	"	"	"	"	67,955
16	"	"	"	"	57,136
12	"	"	"	"	105,383
10	"	"	"	"	8,012
8	"	"	"	"	386,817
6	"	"	"	"	833,008
4	"	"	"	"	690,503
3	"	"	"	"	22,160
					<hr/>
					2,195,921

Or ~~415,471~~<sup>472</sup> miles.

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## HYDRANTS.

When the Water Works were originally constructed there were no fire steamers in use here, in fact they were only talked of elsewhere. The first hydrants were such as were abundantly sufficient to supply hand engines, and were of the New York type. Owing to the large size of the original stopcock districts it was found that the necessary repairs and renewals of hydrants caused sometimes great inconvenience to the district affected. To prevent this a supplementary valve was placed under the ordinary valve, forming what is known as the Cregier Hydrant and tried. It was found to work so well that gradually it was introduced more and more until at present there is scarcely one of any other kind in the city. The exceptions are a few, so arranged or placed as to be exempt from freezing; or to allow a

larger number of steamers than usual to obtain water from them. Many of the Cregier hydrants, especially in the most valuable portions of the city, have more than three times their former capacity for delivering water.

Among the results of the investigations and discussions of the "Citizen's Association," and others, after the fire of July, 1874, was the appropriation of more money for larger mains, hydrants in greater number and efficiency and the introduction to a very moderate extent, as yet however, of a system of reservoirs or cisterns at street crossings. The city as a whole and especially its most valuable portions are much better protected against fire than ever before: but as the Chicago of to-day demands and has a much better protection than Chicago of the past, it would not be safe to stop where we are in this matter if Chicago of the future is to be properly provided for. This provision, so far as the supply of lake water at the pumping stations is concerned, is sufficient for many years to come, and if the present reckless waste of water all over the city can be restrained, there need be but little comparatively expended for new pumping engines, except to replace those that should give place to more efficient ones. If all parts of the city are to be satisfactorily protected, however, it will be necessary to lay larger mains and establish more hydrants in some districts. Now that iron and labor are lower than they are likely to be again for many years it is much to be regretted that more large mains and fire hydrants could not be introduced.

During the year ending December 31st, 1876, the following new hydrants were established, viz:

SOUTH DIVISION.

One southeast corner Adams and Clark streets.

One north side Archer avenue, between Deering and Arch streets.

One north-west corner Archer avenue and Deering street.

- One north-east corner Archer avenue and Bonfield street.
- One south-east corner Archer avenue and Pitney street.
- One south-east corner Archer avenue and Quarry street.
- One north-east corner Archer avenue and Main street.
- One north-west corner Archer avenue and Broad street.
- One north-east corner Calumet avenue and Thirty-first street.
- One north-west corner Farrel street and Archer avenue.
- One south-west corner Lime street and Archer avenue.
- One north-west corner Thirty-second street and Vernon avenue.
- One north-west corner Thirty-second street and Rhodes avenue.
- One north-east corner Twenty-first and Purple streets.
- One south-west corner Vernon avenue and Thirtieth street.
- Total South Division, 15.

## WEST DIVISION.

- One north-west corner Adams and Rockwell streets.
- One north side Augusta street, between Holt and Noble streets.
- One north-west corner Augusta street and Milwaukee avenue.
- One north side Clarinda street, between Ashland avenue and Holt street.
- One north-west corner Cornelia and Holt streets.
- One north-west corner Cornelia street and Milwaukee avenue.
- One south-east corner Division and Noble streets.
- One north-west corner Division street and Elston road.
- One north-east corner Division and Currier streets.
- One south-west corner Division and Currier streets.
- One north side Division street, between Currier and Noble streets.
- One north-east corner Elston road and George street.
- One north side Emma street, between Ashland and Milwaukee avenues.

- One north side Fig street, between Ashland and Milwaukee avenues.
- One north-east corner Fry street and Ashland avenue.
- One south-east corner Fulton and Curtis streets.
- One north-east corner Fulton and Carpenter streets.
- One north side Fulton street, between Halsted and Union streets.
- One north-west corner Holt and Clarinda streets.
- One north-east corner Hubbard and Desplaines streets.
- One north-east corner Lake street and Artesian avenue.
- One north-west corner Lincoln and Kinzie streets.
- One south-west corner Milwaukee avenue and Hubbard street.
- One south-west corner Morgan and Fulton streets.
- One south-west corner Noble street and North avenue.
- One south-west corner Noble street and Milwaukee avenue.
- Two in new pumping works buildings.
- One north east corner pumping works building.
- One north-west corner Oakley and Washington streets.
- One north side Ogden avenue, between Twelfth street and Western avenue.
- One north-west corner Polk and May streets.
- One north-west corner Rose and Clarinda streets.
- One south-east corner Sangamon and Fulton streets.
- One north-west corner Sixteenth and Loomis streets.
- One east side Throop street, 200 feet north of the "south branch."
- One south-east corner Western and Park avenues.
- One north-west corner Walnut street and Albany avenue.
- Total West Division, 38.

## NORTH DIVISION.

- One south-east corner Halsted and Willow streets.
- One north-east corner Kingsbury and Indiana streets.
- One south-east corner Kingsbury and Ohio streets.

One south-west corner Sedgwick street and Tell court.

One west side Sedgwick street, between Menomonee and Linden streets.

One north-east corner Starr and Sedgwick streets.

One north-east corner North Water and Pine streets.

Five south side North Water street, at intersections east from St. Clair street.

One north-east corner Wisconsin and Larrabee streets.

Total North Division, 13.

In all 66, making, together with those previously in, 2,901 hydrants in the city at this date, of which number 872 are double nozzle; 58 received necessary repairs, and 271 were renewed during the year. During the winter months hydrants were found frozen and had to be thawed out in 2,820 instances.

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## STOPCOCKS.

The total number of these in the city together with those established the last year, will be found mentioned below. The stopcocks used here, except the 36 inch ones, are of simple patterns which have been long in use and upon which there are no patent rights. The 36 inch ones have eight inch supplementary valves to relieve the pressure when they are opened with a great head of water on one side.

The stopcock districts, which were originally very large, in some cases as much as a quarter of a square mile, have been very much subdivided, so that now many of them are less than one thirtieth of a square mile, and in case the water should be shut off from one of them, perhaps when a fire occurs in it, it would be quite practicable to lead hose into the middle of such district from surrounding hydrants, provided the nature of the repairs to be made did not allow the water to be let on immediately.

The following stop-cocks were put in during the year, viz :

SOUTH DIVISION.

- One 8 inch, Arch street, south line Archer avenue.
- One 6 inch, Archer avenue, in feeder at Joseph street.
- Two 12 inch, Archer avenue, east and west lines Main street.
- One 8 inch, Archer avenue, in feeder at Main street.
- One 6 inch, Archer avenue, at east end of south branch bridge.
- One 8 inch, Archer avenue, at east end of south branch bridge.
- One 6 inch, Archer avenue, east line Wood street.
- One 12 inch, Archer avenue, west line Quarry street.
- One 24 inch, Archer avenue, west line Main street.
- One 6 inch, Archer avenue, west line Quarry street.
- One 12 inch, Archer avenue, west line Halsted street.
- One 12 inch, Archer avenue, west line Deering street.
- One 12 inch, Archer avenue, east line Lock street.
- Two 8 inch, Archer avenue, in feeders at Lock street.
- One 6 inch, Archer avenue, east line Lock street.
- One 6 inch, Bonfield street, in feeder at Archer avenue.
- One 8 inch, Broad street, in feeder at Archer avenue.
- Two 8 inch, Broad street, north and south lines Archer avenue.
- One 6 inch, Church street, north line Archer avenue.
- One 8 inch, Church street, north line Archer avenue.
- One 4 inch, Dearborn street, south line Lake street.
- One 6 inch, Dearborn street, south line Twenty-fourth street.
- One 6 inch, Deering street, south line Lyman street.
- Two 6 inch, Deering street, in feeders at Archer avenue.
- One 4 inch, Fifth avenue, south line Harrison street.
- Two 6 inch, Farrel street, north and south lines Archer avenue.
- One 6 inch, Farrel street, in feeder at Archer avenue.
- One 4 inch, Farrel street, south line Lyman street.
- One 4 inch, Fourth avenue, north line Twelfth street.

- One 8 inch, Fuller street, north line Archer avenue.
- One 6 inch Greeley street, north line Archer avenue.
- One 6 inch, Haines street, north line Archer avenue.
- One 6 inch, Hanover street, south line Archer avenue.
- One 4 inch, Kossuth street, west line Hanover street.
- One 6 inch, Keeley street, south line Archer avenue.
- One 4 inch, Keeley street, south line Lyman street.
- Two 8 inch, Lime street, north and south lines Archer avenue.
- One 12 inch, Lock street, south line Archer avenue.
- One 8 inch, Lock street, south line Archer avenue.
- One 6 inch, Lyman street, east line Lock street.
- One 36 inch, Main street, south of W. P. tunnel shaft.
- Two 8 inch, Main street, in feeders at Cologne street.
- One 6 inch, Main street, south line Archer avenue.
- Two 8 inch, Main street, in feeders at Hickory street.
- One 6 inch, Main street, south line Lyman street.
- One 8 inch, Main street, in blow off at the bridge.
- Two 6 inch, Mary street, north and south lines Archer avenue.
- One 4 inch, McGregor street, west line Hanover street.
- One 6 inch, Pitney avenue, south line Archer avenue.
- One 6 inch, Purple street, north line Archer avenue.
- One 4 inch, Pacific avenue, south line Harrison street.
- Two 8 inch, Quarry street, in feeders at Archer avenue.
- One 4 inch, Sheridan place, east line Purple street.
- One 4 inch, Sherman street, south line Harrison street.
- One 6 inch, State street, south line Lake street.
- One 8 inch, Twenty-first street, east line Purple street.
- One 6 inch, Twenty-second street, north line Archer avenue.
- One 12 inch, Twenty-third street, east line Wentworth avenue.
- One 6 inch, Twenty-fourth street, east line Wentworth avenue.
- One 6 inch, Twenty-fourth street, east line Cottage Grove avenue.
- One 4 inch, Twenty-fourth street, west line Hanover street.
- One 8 inch, Twenty-sixth street, east line Wentworth avenue.



The following stop-cocks were put in during the year, viz :

SOUTH DIVISION.

One 8 inch, Arch street, south line Archer avenue.  
 One 6 inch, Archer avenue, in feeder at Joseph street.  
 Two 12 inch, Archer avenue, east and west lines Main street.  
 One 8 inch, Archer avenue, in feeder at Main street.  
 One 6 inch, Archer avenue, at east end of south branch bridge.  
 One 8 inch, Archer avenue, at east end of south branch bridge.  
 One 6 inch, Archer avenue, east line Wood street.  
 One 12 inch, Archer avenue, west line Quarry street.  
 One 24 inch, Archer avenue, west line Main street.  
 One 6 inch, Archer avenue, west line Quarry street.  
 One 12 inch, Archer avenue, west line Halsted street.  
 One 12 inch, Archer avenue, west line Deering street.  
 One 12 inch, Archer avenue, east line Lock street.  
 Two 8 inch, Archer avenue, in feeders at Lock street.  
 One 6 inch, Archer avenue, east line Lock street.  
 One 6 inch, Bonfield street, in feeder at Archer avenue.  
 One 8 inch, Broad street, in feeder at Archer avenue.  
 Two 8 inch, Broad street, north and south lines Archer avenue.  
 One 6 inch, Church street, north line Archer avenue.  
 One 8 inch, Church street, north line Archer avenue.  
 One 4 inch, Dearborn street, south line Lake street.  
 One 6 inch, Dearborn street, south line Twenty-fourth street.  
 One 6 inch, Deering street, south line Lyman street.  
 Two 6 inch, Deering street, in feeders at Archer avenue.  
 One 4 inch, Fifth avenue, south line Harrison street.  
 Two 6 inch, Farrel street, north and south lines.  
 One 6 inch, Farrel street, in feeder at Archer avenue.  
 One 4 inch, Farrel street, south line.  
 One 4 inch, Fourth avenue, north line.

- One 8 inch, Fuller street, north line Archer avenue.
- One 6 inch Greeley street, north line Archer avenue.
- One 6 inch, Haines street, north line Archer avenue.
- One 6 inch, Hanover street, south line Archer avenue.
- One 4 inch, Kossuth street, west line Hanover street.
- One 6 inch, Keeley street, south line Archer avenue.
- One 4 inch, Keeley street, south line Lyman street.
- Two 8 inch, Lime street, north and south lines Archer avenue.
- One 12 inch, Lock street, south line Archer avenue.
- One 8 inch, Lock street, south line Archer avenue.
- One 6 inch, Lyman street, east line Lock street.
- One 36 inch, Main street, south of W. P. tunnel shaft.
- Two 8 inch, Main street, in feeders at Cologne street.
- One 6 inch, Main street, south line Archer avenue.
- Two 8 inch, Main street, in feeders at Hickory street.
- One 6 inch, Main street, south line Lyman street.
- One 8 inch, Main street, in blow off at the bridge.
- Two 6 inch, Mary street, north and south lines Archer avenue.
- One 4 inch, McGregor street, west line Hanover street.
- One 6 inch, Pitney avenue, south line Archer avenue.
- One 6 inch, Purple street, north line Archer avenue.
- One 4 inch, Pacific avenue, south line Harrison street.
- Two 8 inch, Quarry street, in feeders at Archer avenue.
- One 4 inch, Sheridan place, east line Purple street.
- One 4 inch, Sherman street, south line Harrison street.
- One 6 inch, State street, south line Lake street.
- One 8 inch, Twenty-first street, east line Purple street.
- One 6 inch, Twenty-second street, north line Archer avenue.
- One 12 inch, Twenty-third street, east line Wentworth avenue.
- One 6 inch, Twenty-fourth street, east line Wentworth avenue.
- One 6 inch, Twenty-fourth street, east line Cottage Grove avenue.
- One 4 inch, Twenty-fourth street, west line Hanover street.
- One 8 inch, Twenty-sixth street, east line Wentworth avenue.

One 8 inch, Twenty-sixth street, west line Hanover street.

One 6 inch, Twenty-seventh street, east line Wentworth avenue.

One 6 inch, Twenty-ninth street, east line Wentworth avenue.

One 12 inch, Thirty-first street, east line Lock street.

One 8 inch, Thirty-second street, east line South Park avenue.

One 8 inch, Thirty-fifth street, east line Wentworth avenue.

One 8 inch, Wabash avenue, south line Lake street.

Total, South Division, 79.

#### WEST DIVISION.

One 6 inch, Ada street, north line Indiana street.

One 24 inch, Ashland avenue, north line Kinzie street.

Two 8 inch, Ashland avenue, near new Pumping Works,  
(blow offs).

One 6 inch, Augusta street, east line Ashland avenue.

Two 6 inch, Augusta street, east and west lines Milwaukee ave-  
nue.

Two 8 inch, Blue Island avenue, in feeders at Twenty-second  
street.

One 4 inch, Chapin street, east line Noble street.

Two 8 inch, Carpenter street, north and south lines Milwaukee  
avenue.

One 8 inch, Carpenter street, north line Fulton street.

One 4 inch, Cornelia street, west line Milwaukee avenue.

One 4 inch, Cornelia street, east line Ashland avenue.

One 6 inch, Chicago avenue, west line Robey street.

One 6 inch, Chicago avenue, west line Hoyne avenue.

One 4 inch, City Pipe Yard, on supply pipe to hydrant.

One 6 inch, Clarinda street, east line Ashland avenue.

One 4 inch, Cleaver street, south line Division street.

One 4 inch, Cleaver street, east line Milwaukee avenue.

Two 6 inch, Desplaines street, south line Hubbard street

One 6 inch, Division street, east line Noble street.

- One 8 inch, Division street, west line Noble street.
- One 8 inch, Division street, east line Milwaukee avenue.
- One 6 inch, Elizabeth street, north line Indiana street.
- One 4 inch, Elizabeth street, south line Indiana street.
- One 6 inch, Elston Road, north line Milwaukee avenue.
- One 6 inch, Emma street, east line Ashland avenue.
- One 6 inch, Erie street, east line Ashland avenue.
- One 4 inch, Fig street, south line Milwaukee avenue.
- One 4 inch, Fig street, east line Ashland avenue.
- One 8 inch, Francisco street, north line Fulton street.
- One 4 inch, Front street, east line Elston Road.
- One 4 inch, Fry street, east line Ashland avenue.
- One 8 inch, Fulton street, west line Curtis street.
- One 8 inch, Fulton street, west line Carpenter street.
- One 8 inch, Fulton street, west line May street.
- One 8 inch, Fulton street, west line Morgan street.
- One 8 inch, Fulton street, west line Sangamon street.
- One 4 inch, George street, east line Elston Road.
- Two 8 inch, Hoyne avenue, north and south lines Chicago avenue.
- One 6 inch, Hubbard street, east line Ashland avenue.
- One 6 inch, Hubbard street, west line Carpenter street.
- Two 6 inch, Hubbard street, east and west lines Milwaukee avenue.
- One 4 inch, Huron street, east line Ashland avenue.
- One 6 inch, Indiana street, west line Carpenter street.
- Two 4 inch, Jane street, east and west line Ashland avenue.
- One 6 inch, Kinzie street, west line Jefferson street.
- Two 8 inch, May street, north and south lines Fulton street.
- Two 6 inch, Milwaukee avenue, east line Union street.
- One 4 inch, Milwaukee avenue, west line Hubbard street.
- Two 36 inch, New Pumping Works in distributing mains.
- Two 30 inch, New Pumping Works in standpipe connections.
- One 16 inch, New Pumping Works in standpipe connections.

- One 36 inch, New Pumping Works in standpipe connections.
- One 6 inch, New Pumping Works in Hydrant supply pipe.
- One 6 inch, Norton street, south line Polk street.
- One 8 inch, Noble street, south line North avenue.
- Two 8 inch, Noble street, north and south lines Milwaukee avenue.
- One 8 inch, Noble street, north line Cornell street.
- One 6 inch, Noble street, south line Indiana street.
- One 8 inch, Noble street, north line Indiana street.
- One 6 inch, Ogden avenue, south line Twelfth street.
- One 8 inch, Ohio street, east line Ashland avenue.
- One 4 inch, Pratt street, north line Milwaukee avenue.
- One 6 inch, Robey street, north line Iowa street.
- Two 6 inch, Rucker street, north and south lines Milwaukee avenue.
- One 4 inch, Superior street, east line Ashland avenue.
- One 6 inch, Thirteenth street, west line Wood street.
- One 36 inch, Throop street, at W. P. tunnel shaft.
- One 4 inch, Throop street, south line Washington street.
- One 4 inch, Throop street, north line Madison street.
- One 8 inch, Throop street, 200 feet north of the south branch (in hydrant supply.)
- One 4 inch, Will street, north line Milwaukee avenue.
- Total, West Division, 85.

## NORTH DIVISION.

- One 4 inch, north Clark street, north line north Water street.
- One 6 inch, north Clark street, south line Kinzie street.
- One 4 inch, Fullerton avenue, west line Hurlbut street.
- One 6 inch, Halsted street, south line Willow street.
- One 6 inch, Hurlbut street, north line Belden avenue.
- One 8 inch, Michigan street, in feeder at St. Clair street.
- One 8 inch, Menomonee street, east line Larrabee street.
- One 8 inch, St. Clair street, north line Michigan street.
- One 12 inch, north Water street, east line Pine street.

One 8 inch, north Water street, east line Seneca street.

One 6 inch, Willow street, west line Halsted street.

One 6 inch, Wisconsin street, east line Larrabee street.

Total, North Division, 12.

In all 176, which, together with those previously in and deducting those taken out for viaducts or other causes would give 2,590 stopcocks of all sizes in the city at this date.

During the year, 12 were repaired and 8 were renewed.

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### FIRE CISTERNS.

No increase in the number of these during the last two years. Only ten have thus far been built.

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### OLD AND NEW LAKE TUNNELS.

As a description of the New Lake Tunnel will be made for the first time in this report, it is thought best to reprint with it the following in regard to the Old Lake Tunnel, taken almost entirely from the Eighth Annual Report Board Public Works.

In 1851, when the population was about 35,000, a charter having been obtained by the city, the present works were commenced. Under the direction of the Board of Water Commissioners, John B. Turner, A. S. Sherman, and H. G. Loomis, the Pumping Works were located on the lake shore on the north side of Chicago River. In recommending this site, the Chief Engineer, Mr. Wm. J. McAlpine, said:

"It is very questionable whether the small quantity of water which is discharged from the river would affect the quality of the water in the lake at a point one and a half miles south.

"From the consideration which I have given to the subject, I am of the opinion that there is no perceptible difference between the quality of the water in the lake above the pier, and at the place one and a half miles south of the river, on which the estimates have been predicated."

The works were put in operation February, 1854. They consisted of one reservoir, containing about half a million gallons, and eight and three quarters miles of iron pipes, besides the Pumping Works. The population at this time was about seventy thousand.

#### ACTION OF WATER COMMISSIONERS RELATIVE TO BETTER SUPPLY.

The increased growth of the city after that time, and the introduction of sewerage, together with the establishment of packing-houses, distilleries, &c., caused such a change in the quantity of filth flowing into the lake, that complaints began to be made of impurity and offensiveness, occasionally, in the supply from the Pumping Works. In 1869, one of the Water Commissioners, Mr. Edward Hamilton,\* proposed to sink a wrought iron pipe, five feet in diameter, one mile out into the lake, to obtain a supply beyond the effect of the river. This project was referred to the Chief Engineer of the Board of Sewerage Commissioners to examine and report upon, with the request "that he also take under consideration, and report on the matter of erecting additional Pumping Works, in such locality as shall secure a supply of pure water."

The report made in compliance with the foregoing request, did not recommend the immediate adoption of any plan, but discussed various projects. Among others, that of a tunnel was

\* The others being Messrs. Orrington Lunt and Benjamin Carpenter



suggested; but it was thought best to defer the whole subject until further examination and analysis could be made, in the hope that much of the complaint against the water supply might prove imaginary.

What, however, was at first apparent only to the most sensitive organizations, soon grew evident to all, and in the course of two or three years more, the water supply became occasionally very offensive, both to the taste and smell. A remedy for this state of things could no longer be neglected.

ACTION OF BOARD OF PUBLIC WORKS RELATIVE TO  
BETTER SUPPLY.

The Board of Public Works, which was created in 1861, discussed the various projects that had been suggested, and made experiments with filtering, which, however, they soon saw would not answer. The Engineer of the Board, after much doubt and careful examination of the whole subject, became more inclined to the tunnel plan than any other, as combining greater directness to the nearest inexhaustible supply of pure water, with permanency of structure and ease of maintenance. The possibility, and, in the estimation of many, the great probability of meeting with insuperable difficulties, in the nature of the soil, or storms, or ice on the lake, was fully considered. One by one the objections appeared to be overcome, either by providing against them, or discovering that they had no real foundation. The plan, when so far worked out as to show how the tunnel might be constructed, was submitted to different engineers, among the number, Col. J. D. Graham, U. S. Engineer, Mr. John B. Jervis, Captain William H. Swift, and L. H. Clarke, Chief Engineer Illinois Central Railroad, all of whom expressed their belief in the practicability of the scheme. Mr. Benjamin Carpenter, first President of the Board of Public Works, supported the plan warmly from the time it was explained to him; and the honorable William



B. Ogden, though not a member of the Board, offered, very early in the history of the project, to advocate it publicly if it should be necessary. The other members of the first Board, Messrs. J. G. Gindele and F. Letz, though very cautious and somewhat doubtful at first, became satisfied with the general features of the plan. In the meanwhile, in consequence of legislative action, a new Board was chosen, consisting of the two last-named gentlemen, Mr. O. J. Rose, and the Hon. F. C. Sherman, the Mayor, who was *ex officio* a member. At the suggestion of Mr. Sherman, more thorough examinations of the soil, consisting of borings every five hundred feet, were made. These fully confirmed what was previously inferred from the known character of the formation underlying the north-eastern portion of the city, and extending out under the lake. The whole Board were now prepared to recommend the project to the City Council.

#### ACTION OF THE CITY COUNCIL RELATIVE TO TUNNEL PLAN.

A committee was appointed by the latter body to consider the subject. This committee consisted of Messrs. C. L. Woodman, J. A. Hahn, and F. C. Brown, Aldermen; F. C. Sherman, mayor, and S. S. Hayes, Comptroller; some of whom were known to have strong doubts with regard to the propriety of undertaking such a work; but the result of their investigations was a unanimous report in its favor. The City Council then passed the necessary ordinances, and the Board advertised the work for letting.

#### PREPARATIONS FOR LETTING THE WORK.

The opening of the proposals was looked to with great interest, as it was feared that no responsible parties would offer to take the work for less than millions, instead of only about three hundred thousand dollars, the Engineer's estimate; in

which not only the public generally, but the Board of Public Works themselves had no great confidence. The result was both surprising and gratifying to the Board. Seven bids were received, ranging in amount from two hundred and thirty-nine thousand five hundred and forty-eight dollars to one million and fifty-six thousand dollars. Owing to failure to appear with sureties at the proper time, and to objectionable conditions, the two lowest bids were rejected.

On the 20th of October, 1863, after considerable inquiry relative to the ability and qualifications of the parties, and a visit of the city's legal adviser, Benjamin F. Ayer, Esq., to Harrisburg, Pennsylvania, to ascertain the standing and pecuniary responsibility of the sureties offered, a contract was entered into for the execution of the work with Messrs. J. J. Dull and James Gowan, of Pennsylvania. To this proceeding the City Council had given their authority by an ordinance dated the fifth of the same month.

#### OPPOSITION

On the evening before the date of the contract, an ordinance was submitted to the City Council, to repeal the authority previously given to the Board of Public Works to enter into contract for the tunnel. The preamble to this ordinance set forth that the construction of the proposed crib would be a permanent obstruction to navigation.

The Board of Public Works to whom this subject was referred, stated in their answer that "The opinion of Mr. Ayer, submitted herewith, shows that the city has clearly the right to build the piers: that Congress, by its paramount authority, may declare the same unlawful structures, and authorize the courts to remove them; but that all previous court decisions establish that, before being ordered removed, the piers must first be shown to be serious obstructions to the lake naviga-

“tion. The piers with their beacon lights will, we think, be  
“helps and not hindrances to navigation — helps to show the  
“sailor his position while in safe waters.

“The Board have, however, already taken steps to procure  
“the sanction of Congress to the erection of the piers: but, if  
“it comes to the worst — that is, if the structures are declared  
“unlawful, and the piers are proved to be serious obstructions  
“to lake navigation, and the courts order the city to remove  
“them — the Board will remove them to such a depth below  
“the surface of the lake that they cannot endanger navigation,  
“as has been contemplated from the first, and as may be done  
“at any rate.”

The repealing ordinance was not passed.

#### OUTLINE OF THE PLAN.

The plan of the work, as thus determined upon, consisted of a land shaft at the western and a lake shaft at the eastern extremity, to be permanent, and three intermediate lake shafts for expediting the construction, to be removed on the completion of the work. The tunnel proper to be two miles in length, beginning on the lake shore near the Pumping Works, and extending out in an east north-easterly direction. The shafts to be protected by cribs, or hollow pentagonal breakwaters, from storms, vessels and ice.

The horizontal diameter of the tunnel was fixed at five feet, and the vertical two inches greater, for convenience in drawing the centers during construction. This size was determined upon for two reasons: *First*, it was sufficient to deliver a supply for one million of inhabitants at the rate of fifty gallons a day for each person, the average quantity used at that time. *Second*, Experience in Europe had shown, that while it was possible to make small tunnels in the most troublesome ground, the attempts to make large ones had sometimes failed, and at

others had been attended with enormous difficulties. This was particularly the case in works of the kind described by Minard in his *Cours de Construction*, pp. 284 and 285, and in the earlier as well as later efforts to construct a tunnel under the Thames.

Although there was every reason to expect easy work here, there was a possibility of meeting with deposits of quicksand or other soft and wet material. In order to remove, as far as practicable, every doubt of the final success of the work, this small size was adopted, in the full conviction that whenever it should prove insufficient to supply the demand upon it, the population and wealth of the city would be abundantly able to construct another, and, if necessary, a larger one.

#### CONSTRUCTION OF THE WORK

The work was commenced at the land shaft on the 17th of March, 1864, the delay, since the date of the contract, having been caused by waiting for the cast-iron cylinders, which had been ordered by the Board, for the first thirty feet, instead of the brick shaft, as originally intended.

These cylinders are nine feet internal diameter, one and one-half inches thick, and in three sections, each ten feet long. The bottom of the lowest section has a cutting edge. The sections were united by internal flanges, bolts and rust joints. The top flange of the cylinder was fitted to receive an air lock, in case that should have proved necessary in the prosecution of the work.

It was intended originally to make the lining of the land shaft of brick clear to the top, but the Board feared trouble from the quicksand, which extended down about fourteen feet from the surface, and particularly as the inlet through which the city was supplied, was not only in this quicksand, but very near this shaft. Owing to the want of suitable pumps, there

was unexpected delay in sinking the cylinders, but as soon as the clay had been penetrated a few feet, all serious difficulty ended, and the remainder of the shaft was sunk to its proper depth through clay of various degrees of tenacity, from very soft near the top to indurated near the bottom. Before reaching the bottom the contractors requested the Board to allow them to go deeper than the plan called for, in order to have a thicker roof under the bed of the lake; but on meeting with water and gas, they concluded that a greater depth would only bring them into greater difficulties, and were content to carry out the original design. The shaft was walled up eight feet in diameter, with masonry twelve inches thick, to the bottom of the cast iron, the inside of which was laid with masonry to the top of the lowest section. At the bottom of the shaft there was a sump six feet below the bottom of the tunnel. This had to be emptied generally twice a day during the whole progress of the work, as the quantity of water discharged from a spring there continued very uniform.

From the bottom of the shaft a drift, at first only intended to be temporary, was made about fifty feet long, westward with a chamber at the end, with fixtures for mounting a transit. The regular tunnel work was commenced May 26, 1864.

The entrance to the tunnel was made six feet in diameter, and tapered down to five feet in a distance of twenty feet. The masonry on this portion was made of three shells of brick work, each four inches thick, with cement joints half an inch thick between. The rest of the tunnel proper was lined with two shells of brick work. It was intended at first to fill the cavities around the outside of the brick work with well tamped earth, but it was soon found impossible to get this done in a satisfactory manner. For this reason, solid masonry was almost immediately substituted for the tamped earth. The upper arch was built on a ribbed center of boiler iron, which diminished

the open space inside of the tunnel only four and a quarter inches, and thus allowed the cars which conveyed away the earth, to go up to the face of the excavation, usually kept from ten to twenty feet ahead of the masonry. The iron center was thirty inches long in the direction of the tunnel. About two feet in length of masonry was usually laid at a time, and, as a rule, it was found safe to strike the center within fifteen minutes after the arch was keyed. At first it was supposed necessary to excavate nearly a foot above the top of the brick work, in order to give the masons room to build the upper arch: but very soon it was found that they could build it perfectly well, generally, without making the excavation any larger than the space required for the brick work. This was done by driving the last four or five top courses of brick into well-tempered cement mortar first thrown into the cavity. The driving of the bricks effectually filled up the spaces which could not otherwise have been reached by hand. The ends of the masonry were left "toothing," and thus furnished a guide in driving the bricks on the upper arch. The lower arch was built by templates or patterns, as ordinary sewers are, and usually kept some six feet in advance of the upper arch, to allow of greater convenience in loading the cars with earth, which the miners had to keep at some distance behind them, and which the shovelers could not throw into the cars very well when they stood under the brick work.

The excavation was, generally, through stiff blue clay, but with the irregularities of character peculiar to the drift. It very seldom required bracing, when not left to support itself more than thirty-six hours. Sometimes sand pockets were met, and when those were over the upper arch, they would empty themselves partly, leaving cavities to be filled with masonry, but these were seldom of much importance. Sometimes small bodies of quick-sand were encountered, but they occurred only in pockets and not in strata, and therefore gave no serious

trouble. Sometimes the clay would be soft enough for a miner to run his arm into it, but, with the exception of requiring a little more "trimming" for the masonry, this gave no trouble. Sometimes boulders, weighing several hundred pounds, were met, and interfered a little with the regular progress of the work, but seldom more than a little.

The greatest and most dangerous difficulty met with, was one that was not anticipated at first, and that was inflammable and explosive gas.

#### CHAMBERS.

With trifling exceptions, this work was prosecuted day and night by means of two sets of miners and one of masons, working eight hours each in every twenty-four, for six days in the week, till the 16th of October, when a point about seven hundred and fifty feet from the center of the shaft was reached. Here it was determined to make two temporary chambers, one on each side of the tunnel, with which they were to be connected by small and short openings. It took about one week to construct these chambers and connections, all of which were supported by timbers and planks. In the tunnel and at the connection between the chambers a turn-table was placed. This arrangement permitted not only the passage of cars by each other, but also the making up of trains, which soon became an absolute necessity for the economical and rapid execution of the work. By means of such chambers, it was practicable to carry on the work a mile or more out under the lake, as fast as could be done near the bottom of the land shaft; in fact, the progress of upwards of a mile out was really greater than it was near the shore, owing to the greater skill and experience acquired on the way.

The character of the work continued throughout very much the same. The greatest progress made during any one week



was ninety-three feet. Only once was a boulder so large as to require blasting, met with. There was a little nervousness as to the effect of a blast under the lake, but it caused no serious disturbance, either of the ground or the masonry.

#### VENTILATION.

The ventilation of the tunnel was effected by means of tin pipes, through which the foul air was drawn out and fresh air consequently drawn in through the main opening.

#### ALIGNMENT.

To determine the position of the lake shaft and the line of the tunnel, much pains was taken to establish an accurate base on the shore for the purposes of triangulation. Owing to the buildings in the way, this was no easy task. To aid in placing the lake shaft beyond all doubt in the line of the tunnel, a six inch tube was sunk two hundred and eighty feet eastward of the land shaft, after the masonry had been carried beyond that point. By plumbing, up through this tube, a "range" of great accuracy for such a purpose was obtained. As soon as the work had been carried so far that the sperm candles used in the alignment could not be seen at "the face" of the work, the center line was produced from point to point, by means of a goniometer with two telescopes, which, when in perfect adjustment, could be made to "reverse" on the same point, which was thus proved to be in a straight line with the instrument and the "back sight." All of the operations, as well as those necessary for lines and levels, at the crib afterwards, were under the immediate direction of Mr. William H. Clarke, the principal Assistant City Engineer, who continued personally to attend to them until other duties and impaired health made it necessary for him to keep out of the tunnel. The final



and very satisfactory result with regard to lines and levels, mentioned hereafter, prove the great care and accuracy with which Mr. Clarke conducted his operations.

#### INSPECTORS AND DOINGS OF THE DIFFERENT SHIFTS.

It was deemed a matter of great importance, on the part of the Board of public works, to have a representative constantly in the tunnel, not only to see that the work was done properly, but to take prompt measures for its safety in case of accident or threatened danger.

Mr. Herman Kroeschell, an educated and experienced mining engineer, was principal inspector of mining, and directed the "trimming" shift, which worked the eight hours immediately before the masons commenced. He set the "patterns" by which the masonry was built, producing for this purpose, the lines and levels given by the engineer in charge, by means of plummets, ranges with sperm candles, and spirit levels. His shift consisted, usually, of four miners and four other men, who at first pushed the loaded cars to and from the shaft, but afterwards to and from the nearest chambers, from which they were hauled by mules to the shaft and back again, either empty or loaded with brick, cement or sand.

The next, or mason's shift, was under the constant inspection of Mr. Edward Everett, employed for years previously in this city as a very efficient inspector of sewers. The average length of masonry laid was twelve feet a day, for the entire distance, but for the first two thousand feet, the greatest progress scarcely equalled this rate. Afterwards it sometimes reached fifteen and a third feet a day; but this latter rate could only be attained by putting on a couple of miners during this shift. The earth they excavated could not be removed from the tunnel while the masons were in, and consequently delayed, to

some extent, the operations of the next or principal mining shift; but this course enabled the contractors to advance the whole work two feet more a day than they could have done without it.

The principal mining shift was under the inspection of Mr. George Dewar, an experienced miner. His chief duties were to keep the excavation within the proper lines, and to watch carefully for the approach of bad ground, so as to be ready with bracing, or to take any other course the emergency might require. Mr. Dewar's health failed during the progress of the work, and he was succeeded by Mr. Edward Offermann, who continued till the tunnel was completed. This shift consisted of four miners and four pushers.

#### PLAN AND CONSTRUCTION OF THE CRIB.

Preparations for commencing operations at the outer end of the tunnel were early made, but owing to disappointments of the contractors in getting the necessary timber for the crib, and other delays, the foundation of the outer, and only one it was found necessary to build, were not laid till May, 1864. This was done on the north side of the river about eight hundred feet west of the light-house. The dimensions of the crib, as required by the specifications, are fifty-eight feet, horizontal measurement, on each of the five sides, and forty feet high. The inner portion, or well, has sides parallel with the outer ones, and twenty-two feet long each, leaving the distance between the inner and outer faces of the crib, or thickness of the breakwater, twenty-five feet. This breakwater was built on a flooring of twelve inch white pine timber laid close together. The outer and inner vertical faces and the middle wall between them were all of solid twelve inch white pine timber, except the upper ten feet of the outside, which was of white oak, to withstand better the action of ice. Across the angles of the outer

and middle walls were placed brace walls about ten feet long, of solid twelve-inch timber. The middle wall on each side of the crib was continued straight through to the outside wall. Connecting the outer and inner walls, and passing through the middle wall, were cross-ties of twelve inch timber, placed horizontally about nine feet, and vertically one foot apart. The ends of all the timbers, where they passed through the outer and inner walls, were dovetailed, and notched half and half into the timbers of the middle wall. All of the timbers used were carefully inspected and well jointed, which was mostly done by hewing, though nearly all of it was first sawed. It was found impossible, however, to get sawed timber of perfectly uniform dimensions. The floor timbers were laid on ground timbers placed directly under the outer, middle and inner walls of the crib. Round one and one-half inch bolts, thirty-six inches long, with large washers at the bottom, were placed vertically four feet apart, to hold the ground and floor timbers firmly to the first two courses of wall timbers above the flooring. All of the wall timbers are fastened to each other by one and one-quarter inch square bolts thirty-four inches long, pointed, and driven somewhat slanting into one and one-quarter inch auger holes about five feet apart. The slant was given in opposite directions to the bolts nearest each other, to avoid the possibility of their being drawn out by the buoyancy of the timber, an accident which once occurred to a somewhat similar structure in the west.

Three rectangular openings, each four feet wide and five feet high, were made through the breakwater at different depths below the surface of the lake, so that water could be drawn from near the bottom, middle or top, as future experience might show to be best. These openings, and wells four feet square from them to the top of the breakwater, were timbered around in the same careful manner as the rest of the

crib. Each well was provided on its inner face with slides for a temporary gate to cut off the water whenever thought necessary.

The floor and walls of the crib were all carefully calked. The interior of the breakwater was divided into seven water-tight compartments, made so by the calking already mentioned, and "matched sheathing" between the walls. The object of these water-tight compartments was to make it easy to build solid masonry in the whole of the breakwater at any time within the course of a few years, if it should be thought best. The whole of the outside surfaces of the outer and inner walls were sheeted with two-inch pine plank carefully jointed, placed vertically, and spiked on. Instead of pine, three-inch white oak was used for the upper portion of the outside, to resist the ice. The upper ten feet of each outside corner was protected by angle-irons, extending each way two feet, and one inch thick, and firmly fastened by two-inch round bolts. From the bottom to the top of the crib, and into which the ends of the angle-irons were let, there were ten pieces of white oak, five by fourteen inches, fastened every two feet to the middle wall, with two inch round bolts. Similar pieces three by twelve inches, thirty-nine feet long, reaching from the top of the crib to the flooring, were fastened by the same bolts to the inside of the middle wall. It will thus be seen that apparently excessive care was taken to make the crib strong; but subsequent experience showed that this care was none too great.

#### LAUNCH.

The crib, when built was in a horizontal position. In order to launch it, it was raised by screws and inclined at an angle of one in twelve towards the water. Seven ways were placed under it, and extended out sixty-four feet into the river on trestle work. The river portion of the ways gave a great deal of

trouble on account of the uneven and stony character of the bottom, and accidents caused by passing vessels. Everything being ready the launch took place on the 24th day of July, 1865, when the crib glided, without accident or delay, gracefully into the water, in the presence of a large number of spectators.

#### SUPERINTENDENCE.

The contractors employed as their foreman, in the construction and launching of the crib, Mr. George R. Bramhall, a mechanic of unusual skill and judgment. The Inspector placed over the work by the Board, was Capt. A. S. Bergh, who had previously had the immediate charge of the lake borings made before the work was let.

#### PLACING AND FILLING OF CRIB.

Immediately after the launch, the contractors towed the crib out to its position in the lake. As soon as the bar was passed, three small gates near the bottom of the crib were opened, and the draft of water, which at first was but a little over eight feet, increased soon after reaching the anchoring ground to twenty-one feet. A mooring screw, opposite the intended position of each angle of the crib had been placed under the direction of Mr. Clarke. To each mooring screw a one and one-half inch chain cable was attached, and the loose end of the chain fastened to a buoy. Unfortunately, lake propellers had destroyed three of these buoys, and it was thought most expedient to substitute for the sunken chains ordinary anchors and hemp cables. As soon as the crib was brought near its position, the work of filling with loose rubble was commenced. Very soon the crib got "out of trim," and one corner of it rested on one of the low bars, peculiar to the lake at this distance from the shore. After some time had been lost in vain efforts to get the

crib righted and into its exact position, the Board became alarmed for its safety, in case a severe storm should arise, and directed that no expense be spared that might seem necessary to the engineer to secure it with the utmost despatch. A wrecking pump was at once employed. By means of this, sufficient water was pumped in or out of the crib, as occasion required, to right it. The partitions between the compartments failed, and it was a matter of rejoicing that they did, for otherwise the removal of the wrecking pump from one compartment to another, could not have been made in time. Three powerful tugs were hired, which, by the aid of sufficient tackle, finally towed the crib to its exact position.

#### STORM AND ITS EFFECTS.

Immediately the contractors resumed the operation of filling the crib with stone, but very soon after a violent storm set in and drove the vessels loaded with stone into the harbor. This storm continued for three days, and threatened, before it abated, to do serious, if not fatal, injury to the crib. In order to hold it in its position as firmly as possible, the wrecking pump was kept at work to fill it with water, the stone thrown in previously not being sufficient to hold it down. During the height of the storm, every wave caused a perceptible rocking of the crib. The angle joints of the inner and middle walls began to separate, and for a time caused intense anxiety. When the storm was over, two of the inner angle joints had parted an inch on top, and the entire crib had worked, against wind and waves, thirteen feet, and the north-west angle was three and a quarter feet lower than the south-east. The great difficulty there would have been in restoring the crib to its exact position, and the fear there might be another storm in the meantime, prevented any attempt of the kind from being made. The very slight deflection this rendered necessary in the line of the tunnel was of no practical importance whatever, though regretted, and

the variation of the sides of the crib from perpendicular, though a constant eye-sore, did not affect its stability. The filling of the crib with stones was proceeded with as fast as the contractors could, and since it was completed, about the middle of August, no variation whatever in the position of this structure has ever been perceived. A tremor is frequently felt during severe storms, and when large fields of ice are passing. The rubbing of field ice against the crib is occasionally accompanied with a fearful noise. At such times the crib appears to a spectator on it, to be an immense plough moving through the ice. On several occasions the broken masses lodged on the south side of the crib, forming banks, several hundred feet long, and reaching from the bottom of the lake to ten or fifteen feet above the surface.

The breakwater portion of the crib being filled with stone, the contractors erected over it a temporary wooden covering, with a light-house on top, and rooms above and below for the accommodation of their own men as well as the inspectors employed by the Board.

#### CYLINDER AND LAKE SHAFT.

The cast-iron cylinder for the lake shaft was made in Pittsburgh, by Messrs. James Marshall & Co., who also made the one for the land shaft. It consists of seven sections, each nine feet in length, nine feet internal diameter, two and one-quarter inches thick, and in all other respects like the one for the land shaft, except that the lowest section was turned on the outside to make it penetrate the clay more easily, and the upper end was provided with two gate-ways for the introduction or exclusion of the lake water. The gate-ways are each fifty-four inches high by thirty-two inches wide, and placed with their tops below the lowest known level of the lake. Each gateway was provided with a sliding gate on the outside of the



cylinder, raised by a screw worked at the top of the cylinder. Provisional arrangements were made at each gate opening for forming chambers on each side, in case it should ever be necessary to repair either gate, by simply sliding in temporary gates. The sliding faces for those temporary gates, as well as of the permanent ones, were made of "composition." Inclined ways were placed inside of the crib, during its construction, to aid in lowering the cylinder to its place, but the storm already mentioned removed them. The lowest and next cylinder sections were put together on an incline. They were held in place, when required, by chains on the outside secured to the lower end of the bottom section, and a brake over the upper side of the cylinder. They were lowered gradually on the incline by means of screws attached to the upper flange. These screws had to be removed, of course, for every new section put on. Care was taken to have sections enough together, before removing the chains from the bottom of the cylinder, to reach above the water, requiring five, or forty-five feet altogether, to be safe. A false bottom of wood was put into the cylinder at its lowest section, to keep out as much water as practicable. This gave the cylinder great buoyancy when sunk to a depth of thirty feet, and made it very easy to handle with blocks and falls placed over-head. On being lowered, the cylinder sunk by its own weight two or three feet into the clay, when the false bottom stopped it. A hole was then bored through the false bottom, and the cylinder went down several feet further by its own weight. After the sixth, or gate section, was put on and the false bottom removed and excavation made within, the cylinder continued to sink by its own weight. After the top section was put on, a moderate force only was necessary to push the cylinder down twenty-three feet below the bottom of the lake. Below this point, the work of sinking the shaft was substantially a repetition of that at the shore end of the tunnel, except that no water was met with, and no pump



ever put in or required. The little leakage that occurred was easily removed in buckets.

An extension eastward about fifty feet, was made, in anticipation of the possible extension of the tunnel at some future day still further out into the lake. This was provided with the necessary sump and bottom on which to place another iron cylinder. The extension was of great service during the construction of the work, as a turn-out for the cars, and afforded by means of a six-inch tube, sunk perpendicular from above the surface of the lake to its outer end, an excellent opportunity to start the line of the tunnel below with great accuracy towards the deflecting point in the middle.

#### INSPECTORS.

As the contractors did not deem it important to employ Mr. Bramhall after the lake shaft was sunk, the Board, highly appreciating his skill and industry, engaged him to perform similar duties to those of Mr. Kroeschell, in tunneling from this shaft. Four different inspectors of masonry were employed, but neither of them staid long, One of them, Thomas McMahon, while employed afterward in the extension of the land shaft, had his ankle broken, which was the only serious accident that occurred to any one whilst employed on the work. It was not considered necessary to have a special inspector for the regular mining shift, this being generally left to Mr. James Brown, the contractors' foreman.

#### TUNNELING FROM LAKE SHAFT.

The work of tunneling was carried on from this end in very much the same manner, and about as rapidly as it was on the first two thousand feet from the land shaft. The average progress made was nine and one-third feet a day till a point two thousand two hundred and ninety feet from the lake shaft was reached, when operations in this direction ceased. When

the work from the land shaft was within one hundred feet of the same point, it was thought necessary to stop the masonry there and run a small timbered drift through to the east face to be certain as to how the lines were going to meet. The two faces were brought together on the 30th of November, 1866, when it was found that the masonry at the east face was only about seven and one-half inches out of the line from the west end. The horizontal measurements were only three inches longer than was estimated by triangulation. This result, considering the difficulty of getting a clear atmosphere in the tunnel, was deemed very good, and much better than was generally expected. The last of the masonry in the regular tunnel, when the two faces were brought together, was completed on the 6th of December, and a stone commemorative of the event placed there by the Mayor of the city, in the presence of the City Council and Board of Public Works, both of which bodies, together with a number of citizens, passed from the shore through the tunnel to the crib, and then by a tug to the city on that day.

#### GATE CHAMBER, CONNECTIONS AND COMPLETION.

In December, the work of filling up the chambers was commenced, and also that of connecting the tunnel with the pumping wells. Much had been done previously toward constructing a gate chamber between the land shaft and the pumping wells. This was made nineteen and one-third feet exterior, and sixteen feet interior diameter, and divided into five compartments, separated by walls twenty inches thick. The outer walls were first built on a boiler-iron shoe or curb, and then sunk by excavating within. An old abandoned inlet gave a great deal of trouble by letting in water: and the boiler-iron shoe which was adopted for the sake of economy, proved more expensive in the end than a cast-iron one would have been. The foundations were on a bed of concrete, twenty-four inches thick, on which the footings of the exterior and division walls, all of

brick, were built. Through the bottom of each division wall, there were left rectangular gate openings, three feet wide and five feet high. The tops of these openings are twenty-three and one-half feet below low water in the lake. In each opening a cast-iron gate frame was built. The gates themselves are tapering. The frames were fitted with wedging grooves or ways, projecting beyond the walls just sufficient to free the gates when raised or lowered. The gates are operated by means of rods stayed at intervals, and by screws with hand-wheels at the top of the walls.

The connection between the land shaft and the gate chamber was of precisely the same size and form as the main tunnel. The connections with each of the pumping wells and the temporary shaft, are all four and one-half feet interior diameter, and were tunneled through soft clay without any difficulty, except a little trouble in working under and through the piling beneath the old pumping well. The connection with the temporary shaft in the old inlet basin, is to be used in case it should ever be necessary to suspend the supply through the main tunnel, either to examine, cleanse or repair it, and has been already so used (*See p. 112*).

A connection between the land and temporary shafts and the mouth of the old inlet on the lake shore, was made by means of a timbered drift through the clay. The temporary shaft consists of a brick well four feet interior diameter and thirty feet deep, provided with a curb built above the water on an iron shoe, held together by iron rods, and sunk by means of the same dredging apparatus that was used for sinking the curb of the new pumping well. Two wooden gates were left in the top of the curb, just below the surface of the water. A small area, enclosing the well and

the inlet, were coffer-dammed around as far as necessary to cut them off from a flow of the lake whenever desired.

The work of filling the chambers of the main tunnel, and the cleansing of that structure having been completed, water was first let into it on the 8th of March, 1867, when only the horizontal portion was filled, this precaution being taken to avoid too sudden a pressure on the masonry. By the morning of the 11th the shafts were filled to the level of the lake. For the purpose of ascertaining if any defective workmanship existed where cavities on the outside of the masonry had been filled in, the water was pumped out of the tunnel sufficiently to permit the engineer and three representatives of the city press to go upwards of half way towards the land. Not a brick was observed to be out of its place or to have started. After the examination, the tunnel was again filled, and on the 24th, about 4 P. M., the mouth of the old inlet was cut off from the lake.

The formal celebration of the completion of the tunnel and introduction of pure lake water, by appropriate public ceremonies, took place March 25, 1867.

#### ESTIMATE AND COST.

The original estimate of the probable cost of the work was three hundred and seven thousand five hundred and fifty-two dollars. The actual cost, including all preliminary and other expenses of whatever nature, chargeable to the Lake Tunnel, up to April, 1867, was four hundred and fifty-seven thousand eight hundred and forty-four dollars and ninety-five cents, made up of the following items, viz:

Engineering and Superintendence .....	\$ 28,774.02
Printing and Advertising ....	375.13
Miscellaneous .....	6,250.03

Labor .....	2,096.20
Lumber.....	1,142.72
Piles.....	1,258.29
Hardware.....	53.85
Castings .....	597.55
Lake Shaft.....	12,629.86
(Gates and Gate Chambers of Lake Shaft, not included in contract of Dull & Gowan.)	
Dredging for Crib.....	1,500.00
Tugs, for Board and Employes .....	6,718.17
Discount on Bonds.....	14,685.35
Opening Celebration .....	979.18
Dull & Gowan, (Contractors).....	380,784.60
	<hr/>
	<u>\$457,844.95</u>

The original estimate was made when common labor was worth one dollar and twenty-five cents a day, which, up to that time had been considered a very high price. It was also made near the beginning of the war, before the difference between the values of gold and currency had much disturbed prices.

The original contract with Messrs. Dull & Gowan to construct the tunnel, was for three hundred and fifteen thousand one hundred and thirty-nine dollars. The final settlement with them was for three hundred eighty thousand, seven hundred and eighty-four dollars and sixty cents, including twenty-seven thousand four hundred and twenty dollars for extras on the tunnel proper, and forty-one thousand two hundred and twenty-five dollars and sixty cents for extras on the shafts, crib and east and west connections.

From the statements and books of the contractors, the actual cost of the work they did, deducting profits, was not more than three hundred and thirty thousand five hundred dol-

lars. The crib and outer shaft cost one hundred and seventeen thousand five hundred dollars; the land shaft cost twelve thousand dollars; the west extension and connection with the gate chamber, no part of the original contract, cost six thousand dollars, leaving one hundred and ninety-five thousand dollars as the cost of the tunnel proper. This being ten thousand five hundred and sixty-seven feet long, made the cost to the contractors eighteen dollars and forty-five cents per lineal foot. The original estimate of cost to the city was thirteen dollars and fifty-four cents. The usual prices paid during the work were, for common labor, two dollars; masons, five dollars; and engine men three dollars per day; for brick, fourteen dollars per thousand; and cement, two dollars and seventy-five cents per cask of three hundred pounds.

#### GENERAL SUPERINTENDENCE AND CONSULTATION.

On the part of the contractors the general charge of the work was taken by Col. Gowan, who was rarely absent from the city. Mr. Dull was very seldom here, but was of much service to the firm by his counsel. These gentlemen persevered through great discouragements, not so much from the intrinsic difficulties of the work itself as from injury to their credit by the reported risks they had to encounter; and from the appalling rise of gold, and consequently of prices, before they finished. Their final success was complete and very gratifying.

Under the Board of Public Works, the general charge was taken by the City Engineer, who frequently visited the work. Erastus W. Smith, Esq., of New York, was consulting Engineer in all matters relating to the iron cylinders and gates. It was supposed at first that the shafts would have to be sunk by the pneumatic process. Mr. Smith believed, as soon as he was consulted on the subject, that this expense and trouble

might be saved, and the event proved the correctness of his judgment. Mr. Smith aided the City Engineer in obtaining important advice from Mr. Webb, the eminent shipbuilder, and others, relative to the construction of the crib.

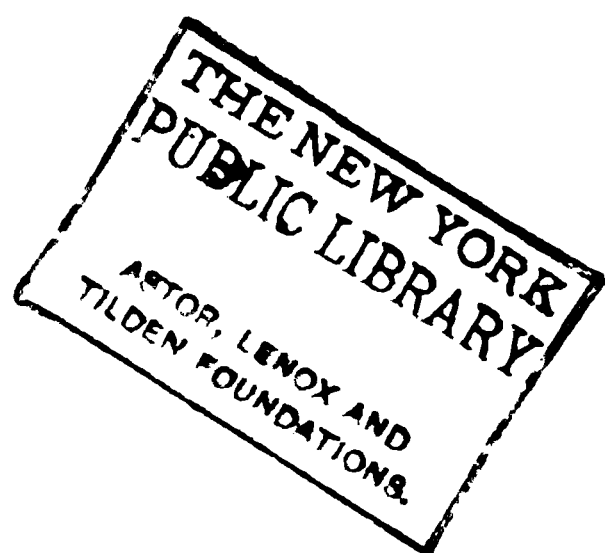
It should be said in this connection that, by the advice of Capt. Swift, before the construction of the crib was commenced, Col. Hartman Bache, U. S. Engineer, was visited at his office in Philadelphia and consulted. He examined the plans of that structure and pronounced them entirely safe.

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## THE NEW LAKE TUNNEL AND LAND EXTENSION.

In the original construction of the first Lake Tunnel, as already mentioned, provision was made for extending it either lakeward or landward, without interrupting the supply through it to the city, except for a very short time, when water could be taken from the shore. It was not supposed however, that any such extension would be required for many years, but the breakage of the 24 inch syphon under Chicago avenue bridge, August 18, 1869, and the consequent privation and exposure to fire of a large portion of the west division of the city, for about sixty hours, caused the City Council to direct the Board of Public Works to take immediate action in reference to the wants of the city.

Under these directions of the City Council, the Board of Public Works who had previously considered the subject, caused further surveys, plans and estimates to be made, and embodied the result of their labors in a report to the City Council, dated October 15th, 1869.







In that report it was recommended that a new tunnel, seven feet in diameter, be constructed from the crib parallel with the old tunnel to the lake shore, there connecting with the old or North Side Pumping Works, and thence to a point on the south branch not further east than Halsted street or further west than Ashland avenue.

The report included an estimate for a new crib above the low water level, and for an increase in the size of the pipe to be laid from the new works; that is, from 24 inches to 36 inches in diameter, between the crossing of Harrison street and Ashland avenue on the north, and that of Thirty-first street and Wabash avenue on the south-east.

The size of the tunnel recommended by the Board was known to be much larger than the immediate demands of the city required, but in view of the probable wants of the future, such a size was shown to be the most advisable, by combined estimates of the first cost of tunnels of different diameters from five to eight feet, and the annual cost of maintaining a supply through each of them as will appear in the following tabular statements.

Diameter of Tunnel in Feet	Extra head in feet required for a Daily supply of Gallons		Estimated Cost in Dollars.	Annual cost of raising the extra height required		Extra cost of Pumping capitalized at 7 per cent	
	50,000,000	100,000,000		50,000,000	100,000,000	50,000,000	100,000,000
5 feet...	23 17	92 66	\$370,083	\$52,345	\$422,766	\$754,328	\$6,033,428
6 " "	9.47	37 88	448,167	21,603	172,827	308,618	2,468,942
7 " "	4.44	17.44	600,356	10,117	80,948	144,531	1,156,258
8 " "	*2.20	*9 10	850 478	5,224	41,792	74,622	596,028

If to the estimated first cost of each size of tunnel be added, the estimated capitalized sums at seven per cent. for pumping the extra head required for 50,000,000 and 100,000,000 gallons in addition to the actual height, the water must be raised above the level of the lake to supply the city, the statement would stand thus :

DIAMETER IN FEET.	50,000,000 GALLONS DAILY.	100,000,000 GALLONS DAILY
5 Feet.....	1,026,911	6,410,411
6 ".....	756,786	2,917,109
7 ".....	744,888	1,766,914
8 ".....	925,106	1,447,506

The new tunnel was located as near the old one as safety would allow, between the crib and the shore, because the ground there had been proved favorable for the construction of such a work, and a connection could be made with the North Side Pumping Works.

The reasons for connecting with the North Side Pumping Works were: *First*, the immediate relief of the pumps of the oldest engines which in consequence of the loss of head through the old tunnel were beginning to be useless at times. *Second*, the saving in the cost of pumping by raising the surface of water in the pumping well eight feet at first and more afterwards, and *Third*, the great advantage of having two tunnels, so that in case either should need repairs or cleansing, the other could still be used.

A new crib of masonry above low water was required because of the certain decay of the old wooden structure, and the danger of its being destroyed by fire.

The plan as recommended by the Board of Public Works was approved by the City Council. Proposals to sell lots for the pumping works were advertised for and received. The one recommended by the Board was at the north-west corner of Main and Cologne streets, with 457 feet river front. The Mayor however disapproved of this selection, and finally after much examination on the part of the Board, and discussion on the part of the City Council, the present site, on the west side of Ashland avenue just south of Blue Island avenue was selected. *See plan p.44.* This site besides being connected with lake navi-

gation and very near general rail road transportation, is very favorably situated for greatly improving the supply to the south western and most southern portions of the city, besides materially benefitting that of the central portions.

Inasmuch as the greatest risk as well as longest time required for construction, was supposed to be connected with the lake end of the tunnel, this portion of the work was offered for letting by public advertisement, and the contract awarded to Messrs. Steele and McMahon early in 1871, but owing to an injunction, the commencement of the work was delayed about eighteen months or till July 12th, 1872. This portion of the tunnel was completed and a party of city officials passed through it July 7th, 1874. The lines and levels of the opposite ends came together with very satisfactory precision, there being no variation of practical importance, or apparent to the eye in passing through the work.

The character of the ground through which the tunnel was made, as anticipated, proved to be very similar to that through which the first tunnel passed, which is described in this report. *See pp 91 and 92.* There was great difficulty, however, in sinking both the shore and crib shafts: in the former case owing to trunks of trees near the bottom of the quick-sand, about sixteen feet below the surface. But this required no unusual appliances or expedients, only very great care in keeping the curbing of the shaft as nearly perpendicular as possible.

The crib shaft is of cast iron eight and one-half feet in diameter, one and one-half inches in thickness, made in sections of ten feet long—except the top one, which was six feet each with flanged ends, except the bottom of the lowest section, which has a cutting edge. The sections were put together at the crib as the work required. The character of operations here is shown by the following extract from pages 68, 69 and 70 of the Thirteenth Annual Report of the Board of Public Works.

"At the crib end much difficulty was experienced in consequence of water passing from the old tunnel to the new work, making it apparently very unsafe to proceed without the pneumatic process, which was required in the contract in case such a contingency should arise. Unfortunately this process, while it preserved the old work from apprehended danger, created a new and unexpected difficulty by the escape of air from the bottom of the new cylinder, and up along the outside to the surface of the lake. The cylinder, however, was sunk to its full depth, and the shaft satisfactorily completed, and a commencement made to push southerly from the cylinder to the line of the new tunnel. The water and earth came in so rapidly from above, through the opening made by the escape of air, as to render further progress impossible by the ordinary methods of tunneling, without endangering the stability both of the old tunnel and the crib. A diver was employed, and great pains taken to effectually close up the opening on the outside of the cylinder. When success in this direction seemed to have been attained, an unsafe quantity of water was found to be passing through from the old tunnel. Efforts were made by the diver to stop this leakage from the inside of the old tunnel without shutting off the supply through it to the city, but without success. To avoid further risk to the old work, and to stop the leak from it with the greatest certainty and least further expense, it was determined to pump out the water from the old tunnel and supply the city for a time from the shore or inlet basin. This operation, always objectionable in itself, because of the inferiority of the shore water, was peculiarly so last summer, on account of the presence of Asiatic cholera in the city, and was therefore postponed as long as possible, in fact, till after all cholera cases ceased to be reported to the Board of Health. After the water was pumped out of the old tunnel to a sufficient depth, the masonry at that end was found to be as perfect as the day on which it was completed. The leakage was traced

to an original defect around the bulkhead placed in the short drift eastward from the shaft, to aid in any further extension of the tunnel that might be determined upon. This defect was easily remedied by closing up the drift with solid masonry, and the further precaution was taken to thoroughly cleanse the lower part of the shaft and about thirty feet of the tunnel westward, and cover them with a thin coat of Portland cement. The water, after having been off seventeen days, was again let on, and there has been no sign of leakage between the old work and the new since.

After waiting from week to week for the filling on the outside of the new cylinder to become compact, which was aided, as far as could be done safely, by draining the water from it through small holes bored in the sides of the cylinder, it was still deemed too hazardous to attempt to prosecute the work in the ordinary way. After careful soundings through the small holes bored in the sides of the cylinder, the clay, which was known to be very firm originally all around, was found to be very soft for about three feet out on the southeast side, from the bottom of the cylinder to the bottom of the lake, the effect, no doubt, of the escape of the compressed air on that side.

It was determined at first to drive pieces of two inch bar iron above and around the side of the drift, through the cylinder and into the hard clay, and then to close the joints between them by another layer of thinner wrought iron. It was afterwards determined to put another floor of wrought iron a few feet above and in a horizontal position. This was composed first of fan-shaped pieces of two inch bars with close joints, which were covered above with a layer of three-quarter inch bars. After this was done it was found that the influx of soft mud below the floors had been completely checked.

Not only the theoretical consideration upon which the new tunnel was planned, but actual experience since its construction

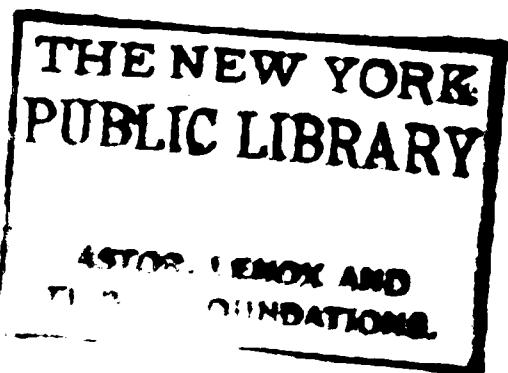


shows that it can be safely relied upon to furnish one hundred million gallons daily, in addition to fifty million gallons daily from the old tunnel. This would seem to be enough for a great while to come, but if the city should, after the present depression passes away, begin to grow again as formerly, and the same difficulty in preventing waste that now exists continue, there may be, in ten years from this time, days in which the capacity of both tunnels will be taxed to the uttermost.

The length of the new tunnel as actually constructed is 31,490 feet, and the top of it, at the west pumping works, is twenty-one feet below city datum or low water in the lake. The accompanying longitudinal section shows the general character of the ground and depth of the tunnel below the surface. It will be perceived that the grade rises rapidly between the main river and the west side pumping works. This was done not only to avoid the extra cost of making the tunnel through the rock, but the risk of a greater evil—that of very objectionable water known to exist in the rock, and which it might have been impracticable to keep permanently out of the tunnel. When supplying one hundred million gallons daily, the estimated average velocity of current through the tunnel would be four feet per second, which is generally believed by engineers to be as great as it would be safe to subject brick masonry to permanently.

In the construction of the new tunnel, as in the old, provision was made for its extension lakeward, in case sewage contamination hereafter should make it necessary or desirable, as will be seen on the accompanying plans of the crib.

Mr. Bryson was ably assisted in the immediate charge of the new tunnel, especially in the difficult work at the crib, by Mr. Eliot C. Clarke. The contractors had an excellent foreman in Mr. Wm. Innes.





**LAKE CRIB.**



1000

## LAKE TUNNEL CRIB.

The original crib built by authority both of the National and State governments (*See p. 122, Third Annual Report of Board of Public Works*), has already been described on pp. 95-100.

For reasons already mentioned, the portion above low-water has been re-built, according to the accompanying plans. The lowest three courses of outside masonry are of granite, adopted on account of its much greater resistance to frost and ice than the limestone of this vicinity, which was selected for the remaining external portion of the crib proper, and for the lower part of the interior walls. The arches and upper interior walls are of brick. The filling between the interior walls and the spandrel backing of the arches is of rubble. All the masonry is laid in hydraulic cement. The deck is composed of a layer of ordinary concrete, on top of which was placed a layer of asphalt concrete. The light-house tower is of brick work with an iron stairway. The lantern is not yet finished, owing to the long-deferred hope of obtaining from the National government a light of the third order, the tower having been planned and thus far built with this view, under advice of United States officials.

Living rooms were finished off in the arches, but they proved damp and disagreeable a great part of the time, and were sometimes flooded during heavy storms. In September last, an extraordinary southerly storm broke into the south window and so flooded the keeper's apartments as to ruin nearly everything he and his family had. Immediately after this a light, low brick house was placed on the west side of the deck, where the keeper and his family have dwelt in much greater comfort ever since.

The duties of the keeper consist in keeping a light on top of the tower during the season of navigation, in making and recording tri-daily observations on the height and temperature of the lake water, on the height of the barometer, temperature of the air and force and direction of the wind. In the winter season he has no light to keep up, but has often the more arduous duty of keeping the inlets to the tunnel shaft clear of anchor ice, for which one assistant is necessary, and sometimes more.

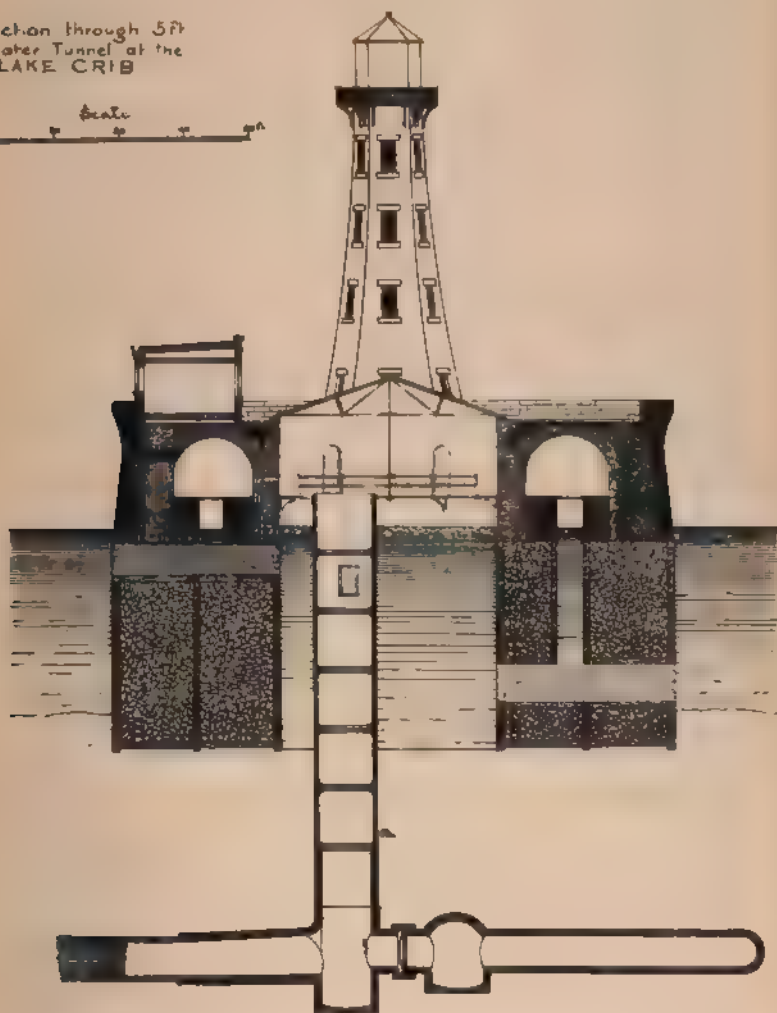
From time to time, ever since the first inception of the work, the stability of the crib has been questioned, but during the past eleven years and more, there has been no appreciable settlement or important movement in any direction, of the original or under-water part of this structure. Immense masses of broken ice are sometimes piled up about it from the bottom to ten and even twenty feet above the surface of the lake, but thus far their effect upon the crib has been very slight, although some of the winters have been remarkably severe.

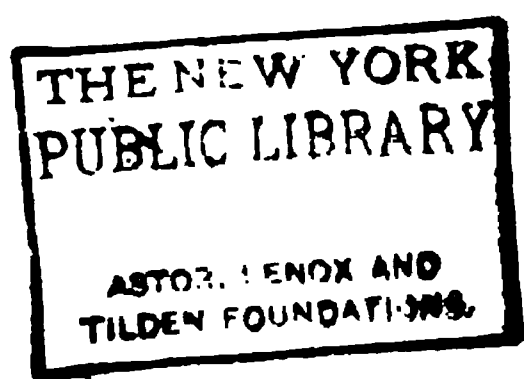
Some of the stones in the upper part of the outside walls have cracked; openings from one-quarter to half an inch wide in the vertical joints of the masonry on each side of the crib exist, and there are some cracks of smaller size in the brick arches, especially at the groinings. Whether these cracks will become larger in the future, it is impossible to determine. They are to be pointed up this season, and, of course, will be watched with great care.

The original estimate presented by the Board of Public Works for the new supply to the West division was as follows:

For new tunnel between the crib and the lake shore.	\$400,000
“ extension of the same to the South branch.....	600,356
“ new pumping works, engine house, land, &c....	300,000
“ stone structure at the crib.....	40,000

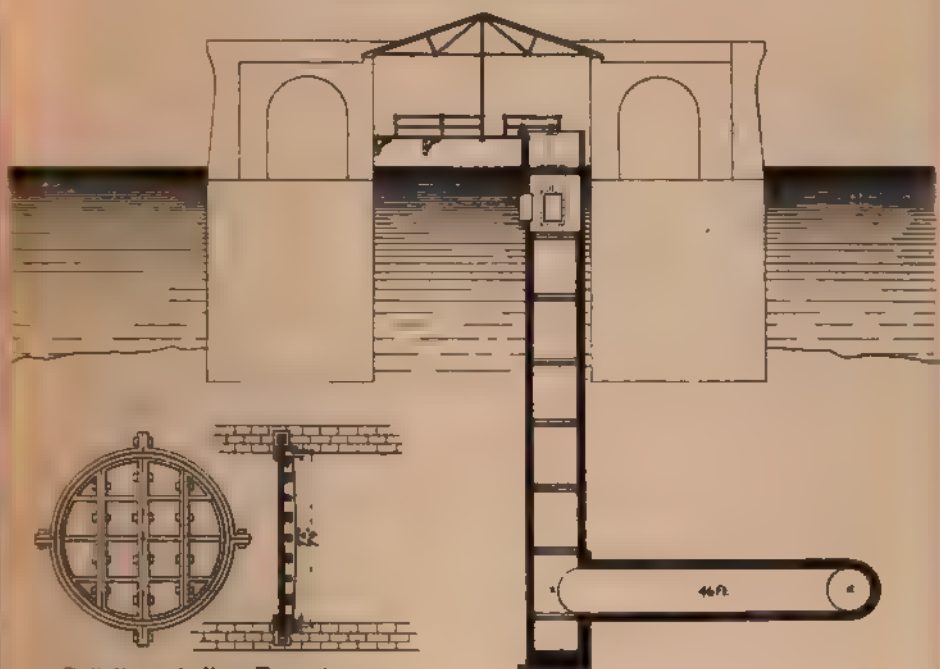
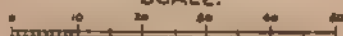
Section through 5ft  
Water Tunnel at the  
LAKE CRIB





Section through New Shaft and Gallery and  
connection with Tunnel at Lake Crib.

SCALE.



Bulk Head in New Tunnel.

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**ASTOR, LENOX AND  
TILDEN FOUNDATIONS.**

For gate shaft.....	40,000
“ enlargement of pipes.....	119,644
	<hr/>
	\$1,500,000

The actual cost of the work has been:

For new tunnel between crib and shore.....	\$414,709 36
“ extension of same to South branch.....	542,912 63
“ new pumping works.....	2497,272 62
“ stone structure at crib.....	63,711 31
(gate, shafts and connections included in cost of new tunnel and extension.)	
“ enlargement of pipe, only partially carried out, but will cost less than.....	119,644 00
	<hr/>
	\$1,638,249 92

The excess of cost (\$138,249 92,) is much more than made up in the item of new pumping works, which cost \$197,272 62 more than the original estimate. This was owing to making the engines considerably more powerful and of better type, and to the erection of a building both larger and much superior in finish than were at first contemplated. The full capacity of the engines however is needed already, and their superior type and construction have proved thus far very satisfactory and promise to be a good investment for the city, by the ease and economy with which they work.

The cost of the pumping engines alone was \$244,612.23; land, \$63,000; leaving the cost of the foundations, buildings, tunnel and pipe connections and other items, \$189,660.39.



## SEWERAGE.

CHICAGO, January 1st, 1877.

*Mr. E. S. Chesbrough,*

*City Engineer:*

SIR.—Herewith is submitted the usual annual returns of the sewers built during the year 1876, and previous thereto, and tabular statements of cleaning and repairs of the sewers during the year, and statement of the private drains connected therewith. The amount of sewers constructed, it will be observed, has been much less than that for many previous years, there being a deficiency in the “Sewerage Tax Fund,” owing to the non-payment of taxes for several years past, of \$127,827.76. The sewers constructed have been chiefly by the owners of property interested in the improvement.

LENGTH IN FEET OF SEWERS BUILT TO JANUARY 1, 1877.

Diam. in feet.	SOUTH DIV.		WEST DIV.		NORTH DIV.		TOTAL THREE DIVISIONS.			
	Previous to Jan'y 1, 1876.	From Jan'y 1, 1876, to Jan'y 1, 1877.	Previous to Jan'y 1, 1876.	From Jan'y 1, 1876, to Jan'y 1, 1877.	Previous to Jan'y 1, 1876.	From Jan'y 1, 1876, to Jan'y 1, 1877.	Totals previous to January 1, 1876.	Totals Jan'y 1, 1876, to Jan'y 1, 1877.	Total Sewers built to January 1, 1877.	Average cost per foot with catch basins
6	2,408	.....	4,237	.....	3,895	.....	10,540	.....	10,540	.....
5½	.....	.....	3,934	.....	.....	.....	3,934	.....	3,934	.....
5	8,798	.....	47,355	.....	13,756	.....	69,909	.....	69,909	.....
4½	4,028	.....	52,171	.....	9,615	.....	65,814	.....	65,814	.....
4	8,062	.....	58,732	1,406	10,706	.....	77,520	1,406	78,926	\$4.00
3½	2,238	.....	16,520	3,984	2,412	.....	21,170	3,984	25,154	3.45
3¼	.....	.....	.....	665	.....	.....	.....	665	665	3.07
3	31,645	.....	23,039	.....	10,490	.....	65,174	.....	65,174	.....
2½	68,381	.....	13,759	.....	26,099	.....	109,262	.....	109,262	.....
2¼	6,359	.....	.....	.....	.....	.....	6,359	.....	6,359	.....
2	96,148	112	241,829	3,260	97,954	.....	430,850	3,372	443,222	1.47
1½	2,438	50	7,720	.....	2,471	92	12,878	142	13,020	1.40
1	157,032	1,436	233,457	3,403	104,473	840	505,805	5,679	511,484	1.05
Total.	387,557	1,508	702,753	12,718	297,905	932	1,388,215	15,248	1,403,463	\$2.40
	389,155 feet,		715,471 feet,		298,837 feet,		or	or	or	or
	or		or		or		262 <sup>4855</sup> / <sub>528</sub>	2 <sup>4688</sup> / <sub>5280</sub>	265 <sup>4261</sup> / <sub>5280</sub>	\$12,672.00
	28 per cent.		51 per cent.		21 per cent.		Miles.	Miles.	Miles.	Per mile.

The total amount expended for construction of sewers for the past year, including catch-basins, &c., and for refunding advances made by property owners for building sewers in previous years, was \$79,545.28, distributed as follows:

South Division.....	\$14,548.14
West Division.....	54,383.80
North Division.....	10,613.34
Total.....	\$79,545.28

The entire expenditure for the construction of sewers for the commencement of the work, in 1855, is as follows:

South Division.....	\$1,287,373.35
West Division.....	2,399,772.03
North Division.....	972,102.18
Total.....	\$4,659,247.56

## SEWERS SOUTH DIVISION.

LOCATION.				Length in Feet of Sewers Built.					
ON WHAT STREET.	FROM	TO		4	3½	3¼	2	1½	1
Archer av	Lime st	South-westerly	..	---	---	---	---	---	330
Archer av	Salt st	North-easterly	..	---	---	---	---	---	100
WING SEWERS									
Lime st	Archer av sewer	12 ft. s.s.	Archer av	---	---	---	62	---	---
Lock st	Archer av sewer	10 ft. s.s.	Archer av	---	---	---	50	---	---
Mary st.	Archer av sewer	10 ft. s.s.	Archer av	---	---	---	---	50	---
Salt st	Archer av. sewer	6 ft. n.n.l.	Archer av	---	---	---	---	---	39
Mary st	Archer av. sewer	7 ft. n.n.l.	Archer av	---	---	---	---	---	49
Joseph st	Archer av. sewer	10 ft. n.n.l.	Archer av	---	---	---	---	---	50
Quinn st	Archer av sewer	10 ft. s.s.	Archer av	---	---	---	---	---	50
Farrell st	Archer av sewer	10 ft. s.s.	Archer av	---	---	---	---	---	50
Keely st	Archer av sewer	39 ft. s.s.	Archer av	---	---	---	---	---	50
Boulfield st	Archer av sewer	10 ft. s.s.	Archer av	---	---	---	---	---	50
Ellias st..	Archer av sewer	10 ft. s.s.	Archer av	---	---	---	---	---	50
Haines st	Archer av sewer	10 ft. s.s.	Archer av	---	---	---	---	---	50
Arch st	Archer av sewer	10 ft. s.s.	Archer av	---	---	---	---	---	50
Church st	Archer av sewer	10 ft. n.n.l.	Archer av	---	---	---	---	---	50
Groesley st	Archer av sewer	10 ft. n.n.l.	Archer av	---	---	---	---	---	50
Lock st	Archer av sewer	10 ft. n.n.l.	Archer av	---	---	---	---	---	50
Fitzney av	Archer av sewer	North and South	..	---	---	---	---	---	100
Lime st	Archer av. sewer	10 ft. n.n.l.	Archer av	---	---	---	---	---	50
Dearborn st.	Twenty second st	13ft s.s.	Twenty s'nd	---	---	---	---	---	46
Butterfield st	Twenty second st	13ft s.s.	Twenty s'nd	---	---	---	---	---	46
Ray st	Calumet av. sewer	6 ft. e.e.l.	Calumet av	---	---	---	---	---	42
Cano st.	Calumet av. sewer	6 ft. e.e.l.	Calumet av	---	---	---	---	---	42
Cano st	Calumet av sewer	6 ft. w.w.l.	Calumet av	---	---	---	---	---	42
				112	50	1436			

## SEWERS WEST DIVISION.

LOCATION			Length in Feet of Sewers Built					
ON	FROM	TO	4	3 $\frac{1}{2}$	3 $\frac{1}{4}$	2	1 $\frac{1}{2}$	1
Western av . . . . .	Fourteenth st	Twelfth st	1323	...	...	...	...	...
Ashland av across to	main shaft at new	Pumping Works.	83	...	...	...	...	...
Western av. . . . .	Twelfth st . . . . .	Harrison st . . . . .	2653	...	...	...	...	...
Chicago av . . . . .	Wood st . . . . .	Robey st . . . . .	1331	...	...	...	...	...
Chicago av . . . . .	Robey st . . . . .	Hoyne av . . . . .	...	...	665	...	...	...
Oakley st . . . . .	Madison st . . . . .	Monroe st . . . . .	...	...	...	438	...	...
Polk st . . . . .	Western av. . . . .	Campbell av . . . . .	...	...	...	604	...	...
Harvard st . . . . .	Western av. . . . .	Campbell av . . . . .	...	...	...	604	...	...
Robey st. . . . .	Chicago av. . . . .	Iowa st . . . . .	...	...	...	697	...	...
Hoyne av . . . . .	Chicago av . . . . .	Iowa st . . . . .	...	...	...	697	...	...
W. Monroe st . . . . .	Oakley st . . . . .	Westward . . . . .	...	...	...	...	...	340
W. Monroe st . . . . .	305 ft. w. of Leavitt	Westward . . . . .	...	...	...	...	...	195
W. Superior st. . . . .	Ashland av. . . . .	Eastward . . . . .	...	...	...	...	...	225
Ada st . . . . .	Madison st . . . . .	Washington st . . . . .	...	...	...	...	...	418
Throop st . . . . .	Madison st . . . . .	Washington st . . . . .	...	...	...	...	...	506
Iowa st . . . . .	Hoyne av. . . . .	Robey st. . . . .	...	...	...	...	...	607
New st. . . . .	Hoyne av. . . . .	Robey st . . . . .	...	...	...	...	...	666
Blue Island av . . . . .	Sixteenth st	North . . . . .	...	...	...	...	(9th)	102
WING SEWERS								
Oakley st	Washington st sewer	6 ft. s. l. Washington st	...	...	...	40	...	34
Norton st	Polk st sewer	South . . . . .	...	...	...	...	...	50
Artesian av	Lake st sewer	10 ft. n. n. l. Lake st . . . . .	...	...	...	...	...	50
Stanton av. . . . .	Lake st sewer	11 ft. s. s. l. Lake st . . . . .	...	...	...	...	...	50
Seymour st . . . . .	Lake st sewer..	10 ft. n. n. l. Lake st. . . . .	...	...	...	...	...	50
Maplewood av	Lake st sewer	10 ft. n. n. l. Lake st. . . . .	...	...	...	...	...	50
Rockwell st	Lake st sewer	10 ft. n. n. l. Lake st. . . . .	...	...	...	...	...	50
			1406	3984	665	3230		3403

## SEWERS NORTH DIVISION.

LOCATION			Length in Feet of Sewers Built.				
ON	FROM	TO				1 $\frac{1}{2}$	1
Sophia st . . . . .	Lincoln av . . . . .	Lincoln pl	...	...	...	92	...
Belden av . . . . .	N. Clark st . . . . .	Eastward . . . . .	...	...	...	...	117
Lincoln pl . . . . .	Sophia st. . . . .	North . . . . .	...	...	...	...	322
Ontario st . . . . .	St. Clair st . . . . .	Eastward . . . . .	...	...	...	...	156
WING SEWERS							
Eugenie st . . . . .	Larrabee st . . . . .	4 ft. e. l. Larrabee st. . . . .	...	...	...	...	45
Menomonee st. . . . .	Larrabee st. . . . .	4 ft. e. l. Larrabee st. . . . .	...	...	...	...	45
Tell court.	Sedgwick st. . . . .	10 ft. e. l. Sedgwick st. . . . .	...	...	...	...	45
Menomonee st. . . . .	Sedgwick st . . . . .	10 ft. w. l. Sedgwick st . . . . .	...	...	...	...	55
Eugenie st . . . . .	Sedgwick st. . . . .	10 ft. w. l. Sedgwick st . . . . .	...	...	...	...	55
						92	840

## CATCH BASINS AND MAN HOLES BUILT IN 1876.

Built from January 1st, 1876, to January 1st, 1877.				Built Total 1876.	Built Previously.	Total.	Average Cost in 1876.
Divisions.	South.	West.	North.				
Catch Basins....	46	106	3	155	7,063	7,218	\$48.90
Man-Holes.....	5	66	4	75	7,764	7,839	10.03

## CLEANSING OF SEWERS FOR 1876.

Methods.	South Division		West Division.		North Division		Totals.		
	Feet Cleansed.	Cost.	Feet Cleansed.	Cost.	Feet Cleansed.	Cost.	Feet.	Cost.	Average per 100 feet.
By Flushing.....	65,515	\$1,370.76	146,150	\$2,760.82	79,894	\$2,413.82	291,559	\$6,545.40	\$2.24
By Chain Machine.	38,548	2,720.03	28,793	1,144.63	22,140	1,830.28	89,481	5,694.94	6.36
Total Sewers	104,063	\$4,090.79	174,943	\$3,905.45	102,034	\$4,244.10	381,040	\$12,240.34	\$3.21
Catch Basins.....	No. of 2,463	\$5,024.68	No. of 3,815	\$8,132.53	No. of 1,467	\$3,947.86	No. of 7,745	\$17,105.07	\$2.20
Total Cost...		\$9,115.47		\$12,037.98		\$8,191.96		\$29,345.41	

## REPAIRS OF SEWERS, CATCH BASINS AND COVERS.

Divisions.	Sewers Repaired.	Cost.	Catch Basins.	Cost.	Covers	Cost.	Total Cost.
South Division.	{ 13 feet of 4 foot, and 85 feet of 2 foot sewers }	\$359.61	56	\$ 629.50	906	\$1,113.50	\$2,102.61
West Division.	{ 497 feet of 2 foot, and 46 feet of 1 foot sewers }	514.22	122	1,126.35	957	1,021.10	2,661.67
North Division	25 feet of 2½ foot sewer..	99.00	61	501.55	572	705.16	1,305.71
	Totals .....	\$972.83	239	\$2,257.40	2,435	\$2,839.76	\$6,069.99

## STREET INTERSECTIONS.

There have been raised to grade, upon streets which were being filled and paved, 779 man-holes and 656 catch-basins, at an expense of \$13,382.90.

## PRIVATE DRAINS.

PERMITS ISSUED DURING THE YEAR 1876

Divisions.	6 Inch.	8 Inch.	12 Inch	15 Inch	Total 1876	Total Previous- ly	Total to January 1st, 1877
West	604	40	6		650		
South ...	211	41	4	2	258		
North .	900	23	1		264		
Total	1,005	104	11	2	1,172	42,024	43,196

## SHORT HISTORY OF THE SEWERAGE OF THE CITY.

It is now twenty years since the sewerage works of the city were commenced, and it may be well to give a short history of what has been done, with a statement of general principles upon which the work has been executed. In the year 1854 it became apparent that a better system of drainage had become indispensably necessary for the health of the city, as well as to carry off the new water supply which had recently been authorized and commenced. Those of our citizens who were living in Chicago previous to that time, can well remember, and those now living beyond the limits of the sewerage system can easily imagine the condition of the streets and lots at that time. The streets were almost impassable, in the wet season, and the lots were frequently half filled with abandoned privy vaults, it being easier to fill them up than to have them cleansed. The cholera appeared during the year 1854, and the death-rate reaching nearly 54 per cent. of the population, doubtless hastened this needed work. Previous to this time, the only works for draining the surface were submerged wooden boxes on a few of the principal streets, which were primarily intended for furnishing a water supply from the river in case of fire, but which served also to give some drainage to the streets, and were afterwards used, to some extent, for house drainage. Accordingly, a very carefully drawn bill was presented to the State Legislature,

which was passed and approved February 14th, 1855. This authorized the appointment, by the Common Council, of three Commissioners, one from each division in the City, in whose charge the work was placed, and Messrs. Wm. B. Ogden, J. D. Webster, and Sylvester Lind were elected early in 1855, who appointed the present City engineer as the engineer of this work. The following sections of the act will give an idea of the duties which were undertaken by this Commission:

SECTIONS 4, 8, 29, 30.

“SEC. 4. It shall be the duty of said Commissioners to examine and consider all matters relative to the thorough, systematic, and effectual drainage of the City of Chicago, not only of surface water and filth, but also of the soil on which said city is situated, to a sufficient depth to secure dryness in cellars and an entire freedom from stagnant water, and in such a manner as best to promote the healthfulness of said city.”

“SEC. 8. It shall be the duty of said Commissioners before entering upon the construction of any sewer in either of said districts, to fix upon a plan or system of sewerage for said entire district, of such a nature that all the subsequent sewers of said district may be executed upon said plan: Provided, also, that the respective sewers which are constructed under this act shall be constructed in such a manner that every sewer as far as built shall be capable of beneficial use independent of the further extension of said sewer, or the construction of any other sewer or sewers.”

“SEC. 29. It shall be the duty of said Board to prescribe the location, arrangement, form, material and construction of every private drain or sewer emptying into the said public drains or sewers, and to determine the manner and plan of such connection; and the work of constructing the same shall be, in all cases, subject to the superintendence and control of said

Board, and shall be executed strictly in compliance with their orders."

"SEC. 30. It shall be the duty of said Board to see that proper drains or sewers are constructed from every lot in the said city which, in their judgment, requires it, and that such private drains or sewers are made to communicate with the public drains or sewers in a proper manner, and they shall have power to require such number of drains or sewers to be thus constructed as they shall deem expedient."

Surveys were made of the greatest part of the city during the year 1855, and during the winter of that year a plan was devised by the engineer, which received the approval of the Council, the principles of which are here briefly recapitulated:

1st. The level of the populous part of the city was found to be so little elevated above the surface of the lake that even with as great a raising of the grades of the streets as was practicable, it was found to be impossible to give inclination to the sewers that would make them entirely self-cleansing. It was found, however, to be possible to give inclinations to them such as would enable them to discharge, by gravitation, all such substances as night soil, kitchen-slops and organic substances generally, while dependence was placed upon excluding, by means of a system of public and private catch-basins, all street dirt, grease, garbage, etc. That this provision does not entirely effect its object, is well known and was anticipated; but the expense of cleansing is far less than the interest would be for raising the grades in order to give self-cleansing inclination to the sewers, or of the enhanced cost of a system of deep sewers, requiring the sewage to be pumped. By flushing the sewers by means of a movable tank, for removing soft material, and by scrapers attached to an endless chain, operated by derricks at adjacent man-holes, for harder deposits, the cleansing two hundred and



sixty-three miles of sewers, and seven thousand street catch-basins has been effected for the past financial year, at a cost of \$29,345, - \$112 per mile.

#### OUTLETS.

After much consideration of plans proposed by various citizens, for a discharge into the lake, for collecting the sewage into a low lying reservoir, pumping it and carrying it into the country for manure, &c., &c., it was decided to discharge the sewage mainly into the river, which would deliver it well out into the lake, and to depend upon an artificial purification of the river. The cutting down of the summit level of the canal has solved the problem for the South Branch, and the Fullerton avenue conduit is expected to do the same for the North. There is, however, a great deal which might be done to prevent the contamination of the river by slaughter houses, distilleries, tan yards, &c., by offal which should be removed and buried. There is nothing in the design of the sewerage system, as constructed, to prevent the building of a system of intercepting sewers, following the course of the river on both sides, and having a discharge into the lake by means of the Fullerton avenue conduit, and probably by another similar work near the southern limits of the city.

#### PLANS.

The general arrangement, in plan, of the sewers is to place mains on each end of the alternate streets running to the river, or about eight hundred feet apart, into which two foot brick submain sewers discharge upon the streets at right angles, and into these from the streets between the main sewer streets, are tributary sewers of twelve inch pipe. All changes of direction in both the brick and pipe sewers are made with curves of liberal radius, and all junctions enter at an angle of  $34^{\circ}$  with the

line of the sewer into which they discharge. Man-holes are built into the sewers at about one hundred and twenty-five feet apart in the smaller sewers, and three hundred to four hundred feet apart in the mains; and junctions for private drains at every twenty feet, on both sides of the sewers opposite to lots. In all sewers the circular form is used, for several reasons. 1st. The greater area for material used, the greater strength and simplicity of construction, the very little increased surface exposed to friction with the ordinary discharge than with other forms of sewers, and for the local reason that it is here necessary to sewer very low lying districts, where the crown of the sewer must be kept as low as possible. The main sewers, from six to three feet in diameter, are built eight and one-half inches thick, and the two and one-half and two foot sewers four inches thick. Vitrified clay pipes of twelve and fifteen inches in diameter are used, having butt joints connected with collars, so that any single pipe can be taken out, on occasion, without disturbing others.

#### GRADES OF SEWERS.

The following minimum inclinations were given to the sewers, which produce a velocity, when running half-full, of about 2 feet per second:

From 6 feet to 4 feet, 1 in 2,500; 3½ feet, 1 in 2,000; 3 feet, 1 in 1,666; 2½ feet, 1 in 1,250; 2 feet, 1 in 1,000; 1½ feet and 1 foot, 1 in 500. In locations where greater inclinations could be had, they were given.

The construction of sewers was continued under the Board of Sewerage Commissioners until April, 1861, when all the works of the city were placed under the direction of the Board of Public Works. Up to this time there were built 283,586 linear feet of sewers—53½ miles—the sanitary effect of which was to diminish the death-rate from 2.46 per cent. per annum in 1855, to 1.88 in 1860.

Since the consolidation of the public works of the city, to this date, there have been laid 209½ miles of sewers, at a cost of \$4,068,817, under the charge of the undersigned, and the principles of the original design have been strictly adhered to. Of the 609 miles of streets in the city limits, 265 miles of the more densely populated portion have been sewered, leaving large areas in each of the three divisions of the city which will soon require attention. The southernmost portion of the city presents the greatest difficulties, since, owing to the slight elevation of the ground above the river, more or less filling will have to be done to cover the sewers. The present sewers discharging eastward into the river, on and south of Harrison street, can be extended westward to Western avenue. South of Harrison street, as far west as Western avenue, the sewers will discharge into the West Branch of the South Branch of the river. West of Western avenue the area will be drained to the South Branch by a series of mains on streets at intervals of one-quarter of a mile apart, which will extend northward to Chicago avenue, intercepting the drainage of that territory from the sewers discharging eastward to the river, since the sewers were planned of a size sufficient only to convey the drainage of the old city area east of Western avenue. At the intersection of Western and Chicago avenues, is the culmination of an outcrop of limestone, which there comes to the surface, and which is rather extensive. It is not proposed to cut sewer lines through this rock, but to arrange the direction of the sewers so as to flow away from this locality in more practicable soil. There is also a tract west of Ashland avenue, and south of Sixteenth street, where the rock will interfere with the sewers to a greater or less extent.

Plats of the sewers to scale of fifty feet to an inch, showing also, all private drains connected with them since October, 1871, have been kept up, and as far as has been possible the

records of the drain connections before that date have been restored.

#### GRADES OF STREETS.

When the surveys were made in 1855 for the new sewerage system, it was found that the surface of the ground along the North and South Branches of the river was only three or four feet above the average surface of the water of the lake, but rising irregularly eastward until, at Michigan avenue and Rush street, it was from ten to twelve feet above the same level, and also rising westward to about the same level at Ashland avenue. This, of course, involved the necessity of raising the grade of the streets, in order to cover the sewers, in those parts of the area of the city which required it. After a good deal of discussion it was decided to fill to a level of ten feet above ordinary water on the streets adjacent to the river, raising them with an inclination sufficient to protect the sewers and to give cellars of seven and one-half to eight feet in height. A greater height of surface was strongly recommended, but it was supposed that great difficulty would be experienced in attaining the requisite earth for the above minimum filling. It has, however, been found that the surplus earth of the South Division has been sufficient not only to raise the grade of the streets, but to fill up the whole of the lake basin between the railroad and Michigan avenue. The grades of the streets have been fixed on the following plan: 1st. In the localities where the ground was high enough to cover the sewers to conform to the natural surface, merely cutting out any abrupt and sudden irregularities. In localities where the ground was too low to allow of well-drained cellars, the grade was fixed at such a height above the surface of the lake as to give not less than seven feet head room in the cellars, if they were entirely below the surface of the ground, and more if the principal floor was elevated above the level of the street. The great conflagration of 1871 gave an opportunity

of raising the grade in that part of the city which had been burned over, which was immediately made use of, and on the eighteenth of October an ordinance was passed raising the grade from one-half to two and a half feet in the burned district. The benefit of this change was found to be very great in the construction of the new business structures, which now have light, well drained basements, in place of cellars subject to inundation by any sudden rise in the lake.

The portion of the city west of Ashland avenue and south of VanBuren street will all require to be raised from one to four feet to protect the sewers, and more than that amount if deep well-drained cellars are desired. It is considered to be very important that the grades should be fixed high enough for both the above purposes, even if the filling first done shall be sufficient only for the first named object. This will save the city from any claim for damages if it should be found desirable at any future time to carry out the raising to the highest level. Surface levels are now being taken of the entire area of the city, where grades have not been fixed, for the determination of suitable heights, for an ordinance to establish them as ordered by the Council, October 30th, 1876.

#### PRIVATE DRAINS.

The functions of the sewerage system of every city are two fold; public and private. The streets are to be drained of the rain and snow falling upon them by means of gutters and catch basins connecting with the sewers at suitable intervals; and a still more important office is to discharge the solid and liquid excreta and refuse from the houses. To do this, and at the same time to exclude from the houses the foul air of the sewers, requires the connections with the houses to be made with care and faithfulness. This is not, as is supposed by many, the office of the public authorities. Every one connecting with the public sewers is required to sign an agreement that he will have his drains laid according to certain plain rules which are printed on

the back of his permit. If these rules are faithfully observed it is believed that there is very little danger of sewer gas passing into the houses. No one is permitted to lay drains connecting with the public sewers who has not a license to do so from the Department of Public Works, and inspectors are employed to examine drains when laid and to detect and report any irregularities on the part of drain layers, whose licenses are revoked in case they violate the rules of the Department. But it would be manifestly impossible for the few inspectors employed by the city to watch the whole progress of the work of laying every drain, and much careless work is doubtless buried up and escapes detection. This thorough inspection ought to be done by competent and faithful men employed by the architects. This service could be performed for from five to twenty dollars for each house and would be the best expended money that the owner could put into its construction.

In this connection something may be said on the subject of the ventilation of the public sewers. In cities like Paris, where the night soil is excluded from the sewers, it may be possible to make of them pleasant and well aired sub-ways; but it is not probable that any city which has enjoyed the benefit of the cheap and facile system of water carriage for its animal excreta will abandon that practice, and it only remains to carry off, as we best may, their exhalations. This has been done so far, in this city, by the means of untrapped rain water pipes connecting with the sewers. From the experience of some European cities it is thought that it may be more effectually done by perforated manhole covers of cast iron in the middle of the streets in place of the present closed ones, and without causing any offense to the public, and an experiment will soon be made of this method.

Respectfully submitted,

W. H. CLARKE,

*Principal Assistant Engineer.*

## CONDITION OF THE RIVER.

The same objectionable state of things in reference to the condition of the river that was described in the last annual report continued to exist last year, and from the same cause, that is, the large quantity of water which flowed from the Desplaines river into the Ogden and Wentworth Canal, and through this and the west fork into the South Branch of the Chicago River. The beneficial effect otherwise naturally expected and formerly experienced from the deepening of the Illinois and Michigan Canal was neutralized by the feeding of the canal largely, and sometimes wholly, with Desplaines water, thus greatly obstructing at times the flow of the drainage of most of the city through the canal.

It is believed now that such an understanding with all the parties interested has been arrived at as will permit the building of a temporary dam at the head of the Ogden and Wentworth Canal, sufficient to restore the South Branch to its former condition, and also allow experiments to be made to show how high the dam may be raised permanently without injury to the just rights of any.

## FULLERTON AVENUE CONDUIT.

To remedy the very offensive condition of the North Branch, as it has been during the warm season, ever since the deepening of the Illinois and Michigan Canal, as well as for sometime before, the Fullerton avenue conduit was proposed as early as 1862 in its present form, and a canal between the lake and the North Branch, to effect the same purpose, was suggested in 1855.



In their Ninth Annual Report the Board of Public Works, after saying (p. 17) "but one of the many schemes proposed seems to them to promise to be effectual and worthy of adoption, that is, the construction of a canal, opened or covered, between the lake and the North Branch, through which the water shall be forced by mechanical means either into the river or lake, as shall at the time be necessary," for further details refer to the appendix of the same report, pp. 121-126, to an article which embodies a statement of the different projects proposed, and the reasons in favor of the one recommended. It is here reproduced:

"The necessity of preventing the river from becoming offensive has been seen from the very commencement of the sewerage system of this city, and was provided for in the plan adopted; but, for reasons it would be useless to discuss here, that portion of the plan has never been carried out. It was hoped that by arranging the sewerage system so as to have but very little filth discharged into the North Branch, it might be many years before it would be necessary to carry out any expensive works to purify that stream. Up to this time it has not received five per cent. of the sewerage of the city, and it is very difficult to see why it should be so foul, unless it is caused mainly by the distilleries on its banks. The vigorous measures of the Board of Health seem to have diminished very much the nuisances caused by those establishments, and yet there are offensive peculiarities in the North Branch almost impossible to trace to any other cause.

"Of the numerous plans proposed for cleansing the North Branch, four classes may be mentioned, viz:

- "1st. Intercepting sewers.
- 2nd. Canals between the river and the lake.
- 3rd. Reservoirs high up the river.
- 4th. Artesian wells.



“By intercepting sewers, it is proposed to prevent the drainage of the city from being discharged into the river, and thus avoid polluting it. Such sewers should be made near to and parallel with the river. They would necessarily be lower than the lake, and incline towards their outlet, requiring their contents to be pumped up. Here arises an important question as to whether there should be but one outlet to the whole city, and where that should be. A proper answer to this question must depend upon the right answer of the first, if not all, of three others, viz:

“1st. What is to be the final use or disposal of the sewage of the city?

“2nd. What the probable cost of any plan of intercepting sewers?

“3rd. The cost of maintenance?

“The proper or best disposal of the city sewage has been the subject of much inquiry and extensive experiments in Great Britain and on the continent of Europe, during the last twenty years. The course of all these has been observed with great interest here. The result thus far seems to be that no city containing a population of 100,000 or upwards, has been able to utilize the contents of all its sewers in the irrigation of land, and yet, of all the methods hitherto tried, this has by far the greatest number of able advocates, both in England and France. The attempt to manufacture sewage into solid manure has proved a commercial failure. The process of deodorization by means of lime or chemicals is enormously expensive, and has not proved satisfactory in its results. As yet there seems to be no alternative for large cities but to discharge the contents of their sewers into some running or large body of water, and at the nearest point compatible with public health. What the future may develop it is difficult now to foresee, but in the light of experience thus far gained, the strong probability is that the ultimate receptacle

ot the sewage of this city must be the lake, either from the river, or from the outlets of intercepting sewers. In the latter case, the contents of the intercepting sewers would descend towards the lake, and there be pumped up. If, however, irrigation of the land should ever prove advantageous here, then the intercepting sewers should incline towards the districts to be fertilized, and their contents there pumped up.

“The dry earth system, including the use of earth-closets, has some advocates, but is not yet known to have been introduced extensively into any large European city, and does not grow in favor, as it was hoped would be the case. If this system could be carried out, it would be more applicable than irrigation to a climate like ours — very cold part of the year; but the objection to giving up water-closets, inside of respectable dwellings, for earth-closets, seems to be very great to most persons. Besides, human excrements, though undoubtedly the most valuable portion of the sewage of a city, do not constitute one-fifth part of it. How the remainder is to be successfully treated by the dry earth system, is a problem not yet solved.

“The probable cost of a complete system of intercepting sewers for the whole city would depend upon the district and population it might be determined to provide for. From different trial estimates, it would be safe to say that such a system could not cost much, if any, less than \$3,000,000.

“The cost of maintenance would necessarily depend upon the plan adopted with regard to outfalls and machinery, as well as the population to be provided for, and could not, therefore, be the same year after year, unless the city should cease to grow.

“Canals between the lake and the river, on various lines and of different dimensions and forms, almost countless in number, might be proposed. The result of investigation with regard to what the city has the power at present to do, leads to the recom-

mendation of a covered canal or conduit, circular in form and 12 feet in diameter, on the line of Fullerton avenue, with the requisite machinery for pumping or driving water in either direction, near the North Branch. Such a canal would be two miles long and, with a bottom 14 feet below low water and a head of  $4\frac{1}{2}$  feet, could be made to discharge 24,000 cubic feet per minute, or sufficient to change all the water in the North Branch and main river every thirty-six hours.

“The estimated cost of the canal is \$480,000, including machinery. The machinery recommended is a 300 horse-power engine, and a propeller wheel so placed as to draw or drive the water in the direct line of the canal.

“To avoid a large portion of the estimated cost of a covered canal, it has been proposed to make an open one. The damage to real estate alone by such a work would probably be greater than the entire estimated cost of the covered canal.

“A navigable canal has also been proposed, sufficient to pass the largest vessels navigating the lakes, thus creating four miles of additional dock front, and rendering it much less expensive to force the necessary quantity of water either into or out of the river, because six inches difference of level in the navigable canal would produce more effect than sixty would in the proposed covered one. But both the authority and propriety of the city's undertaking such a work are very doubtful.

“This is perhaps the most proper place to mention that some of our ablest citizens have started the project of a ship canal between the North Branch and the lake, two and a half miles north of the city limits, where the ground is very favorable for such a purpose, and the land much cheaper. Should this work ever be carried out, and the North Branch be made navigable to it, the owners of such a canal could easily supply the current

desired, and a much greater one than it would be practicable to supply through the covered canal.

"To avoid the expense of steam machinery for producing the requisite current in the covered canal, it has been proposed to construct a long basin, with sloping sides, on the lake shore, and let the winds and waves drive water enough into it to supply the canal. Besides the various doubts with regard to the working of such an arrangement, the necessity of always relying upon a current from the lake into the river would be very objectionable.

"It is expected that by next spring the South Branch will be drained into the Illinois river, through the deepened canal, but it was never supposed that this would purify the North Branch. If the North Branch must discharge its filth, in all stages of the stream, and at all seasons of the year, into the main river, then the water to flow from the main river into the South Branch, instead of being drawn from the lake, would be the foul discharge of the North Branch. It is easy to see that in that case there would be great disappointment with regard to the expected benefit of deepening the canal. It would therefore be necessary, in constructing a canal between the North Branch and the lake, for the purpose of purifying the former, to provide for discharging into the lake whenever there might be very little or no natural current in the river.

"A reservoir high up the stream, sufficient to supply for one month the quantity it is proposed to drive through the covered canal, would, it is estimated, cover about 2,500 acres. When it is considered that not merely one month's supply, but four, and possibly six or even more, might be needed, it seems useless to discuss such a plan. But if the great cost of this plan did not stand in the way, the impossibility of producing any current, especially towards the mouth of the river, would be a great objection. Besides, the necessary exposure of such large surfaces as a reser-

voir would cover, by the drawing down of the water, in warm weather, could not be tolerated.

“Supposing it practicable to get water enough from artesian wells to produce the requisite current, leaving out of view the objection that it would be impossible to turn that current from its natural course into the main river, the number of such wells, judging from the most successful one yet bored in this city—that of the Union Stock Yard Co.—would have to be 405, that is, if 24,000 cubic feet per minute should be required. All experience thus far, in other cities and countries, where many artesian wells have been bored, goes to show that their enlargement, either in size or number, does not produce a corresponding increase in the quantity of water furnished. There is no good reason why a different result should be expected here, but strong proof to the contrary.

“In view of present knowledge and experience, it does not seem advisable to commence the construction of a system of intercepting sewers just yet, though the probability of having to do so ultimately seems rather to increase from year to year. More time seems to be needed to determine upon all the conditions that should be required of such a system.

“If nothing more can be done to prevent nuisances in the North Branch, and the measures of the Board of Health seem to discourage hope in this direction, then the most advisable course the city has power at present to adopt appears to be to construct the proposed covered canal on Fullerton avenue, and for the following reasons:

“1st. It could be made to discharge either into the lake or the river, as circumstances might require. During wet seasons, in the spring and fall, nothing is needed besides the natural flow to cleanse the river. An artificial current from the river to the lake would be needed when that of the river was very slight, and in

an opposite direction when the natural discharge from the North Branch was too great to be overcome by the amount the canal could discharge into the lake, and yet not strong enough to cleanse the river.

“2nd. It could be made the outlet of a system of intercepting sewers for the northern portion of the city, supposing the limits to be extended by future legislation, several miles further north.

“3rd. It would afford a very convenient and economical outlet for the sewers of a large part of the district likely to be annexed to the city north of the present limits, between the lake and the river. It is doubtful if, in view of the probable future growth of the city, a better location could be selected for the outlet of a northern system of intercepting sewers.

“An apparently serious objection has been raised to this plan. It is that the outfall of sewage on the lake shore, at the end of Fullerton avenue, would create a nuisance on the Lake Shore Drive.

“There can be no doubt that the water of the lake shore would sometimes be discolored when it might otherwise be clear; but lake water enough introduced into the North Branch to render it inoffensive to the smell, and then discharged through the proposed canal into the lake, would be equally inoffensive.

“Let what may be done, such a city as this cannot get rid of all its filth without producing something unpleasant to sight or smell somewhere, and no more convenient or economical receptacle for the whole of it can be suggested at present than the lake, if the objectionable condition of the North Branch is to be remedied.”

From 1870 to 1874 the purification of the North Branch was much discussed. Plans and specifications for the work were prepared, and proposals for executing it advertised for and received

three times before it was let. Finally a contract was entered into with Messrs. George F. Norris & Co., March 28th, 1874. By the term of their contract they were to construct the conduit 12 feet in interior diameter, the invert at a grade of 13 feet below city datum, and from the North Branch of the Chicago River to Lake Michigan. They began excavation for the conduit about the 1st of June of the same year, at Ashland and Fullerton avenues, and on the 22nd of that month the masonry work was begun. Work was carried on east and west from Ashland avenue until the 8th of December following, when it was discontinued, having reached points 40 feet east of the east line of Racine avenue, and 1500 feet west of Ashland avenue, including 4,191½ feet of conduit. The price Norris & Co. were receiving, being, as they found, insufficient to complete the contract, they claimed that the character of the work had been misrepresented in the original specifications. The Board of Public Works denied the claim, but a settlement was effected with the City Council, on the 14th of June, 1875, and the contractors were released [from further obligation to the city. On the 26th of July, 1875, proposals were received by the Board of Public Works for the completion of the conduit between the eastern terminus of the work done by Norris & Co. and the lake, including the lake outlet; the contractor having the option of doing the work in open excavation, or by tunneling at a lower grade, he to take all risk whatever in connection with the work in any case. The work was awarded to Messrs. Fitzsimons & Connell, and on the 13th of September, a contract was entered into with them for the completion of the same.

They concluded to do the work by tunneling, and on the 28th day of October, 1875, began building brick work upon the shoe for the

#### LAKE SHORE SHAFT.

This shaft was completed November 21st, and tunneling be-

gan immediately thereafter. The ground at the depth tunneling was done (55½ below datum) was found to be very good, and the rate of progress correspondingly good for so large sized a tunnel. On the heading east of the shaft the average day's work was nine feet, and on the west heading eight feet. The east end, a distance of 999 feet from the centre of the lake shore to the centre of the lake shaft, was completed April 30th, 1876. The work on the west end was suspended, under Clark street, on the 25th of August, 1876, at a distance of 1,696 feet from the centre of the shaft.

#### LARRABEE STREET SHAFT

November 20th, 1875, brick work was laid for a working shaft at Larrabee street. In sinking the shaft rock was met with at a depth of 25 feet below city datum. After delays, through accidents to the shaft, caused by endeavors to start tunneling, and by the destruction of the building at the mouth of the shaft by fire, tunneling was finally successfully begun, on the east heading, the 23rd day of February, 1876. This was not, however, successfully accomplished on the west heading until May 11, 1876. The grade of the tunnel at this shaft is 34½ feet below the city datum, thus making three-quarters of the depth of the tunnel in rock. The object of going so low in the rock was to avoid the soft clay which was found to overlie the hard-pan immediately on top of the rock. It was this soft clay which was the indirect cause of the accident to the shaft and which subsequently, on the east heading, caused delays of days and sometimes weeks in the prosecution of the work. From the shaft eastwards a distance of 400 feet, about three-fourths of the depth of the conduit continued in rock, the remaining one-fourth being in clay and hard-pan above. At 450 feet from the shaft the rock entirely disappeared. Work was suspended on this end under Clark street February 4th, 1877. A point 929 feet east of the centre of the shaft was reached, leaving a distance



of only 13 feet between this heading and the end of the work built from the lake shore shaft.

West of Larrabee street shaft the grade of the tunnel ascended to 32 feet below datum, and continued level from that point to its connection with work done from Sheffield avenue shaft. About half of the conduit on this end is in rock. March 16th, 1877, the headings above the rock from Larrabee street shaft and Sheffield avenue shaft met under Halsted street, at a point about half way between the two shafts. The invert was completed April 2, 1877.

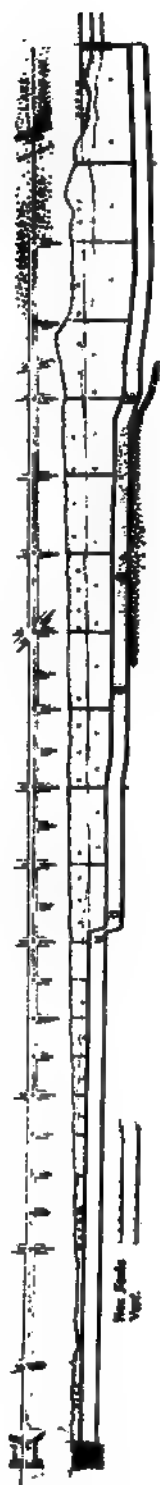
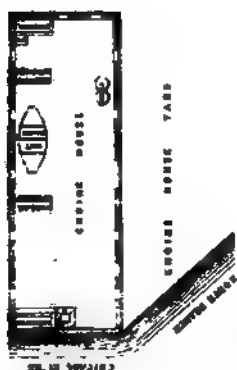
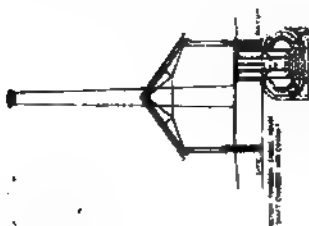
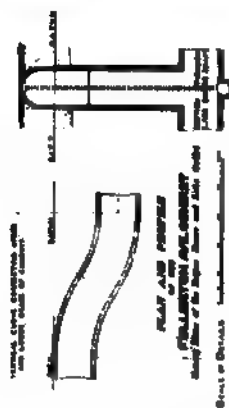
#### SHEFFIELD AVENUE WORKING SHAFT

was built during the month of May, 1876, and on June 1st tunneling was commenced at a depth of  $27\frac{2}{3}$  feet below city datum, and progressed without interruption, on the west end, until it had reached a point 1,215 feet from the centre of the shaft, where work was discontinued, January 22nd, 1877, leaving a length of 35 feet to connect with the work done by George F. Norris & Co.

East of Sheffield avenue shaft the work progressed well, but with some interruption from soft ground. Rock was encountered 1,143 feet from the centre of the shaft. From this point to its connection with the work from Larrabee street shaft (1,310 feet from Sheffield avenue), the arch was built on top of the rock, as at Larrabee street. The rock was subsequently blasted out of the invert, which was afterward lined with brick. All the rock was removed from the tunnel through the Larrabee street shaft.

It is intended to force the water through the conduit by means of two screws like those of an ordinary propeller; one to be fixed at each end of a horizontal shaft forty feet in length. The shaft to be placed in the centre line of the conduit, and pass through a boat-shaped iron chamber ten feet in greatest diameter. The conduit is to be divided, by the chamber, into two





channels for the water, and contracted at the screws to about one-third its usual sectional area.

The shaft and screws are to be operated by two single cylinder condensing engines, with thirty inches stroke, and coupled at right angles to the shaft. The cylinders are to be twenty inches in diameter and supported by the iron chamber at the level of the engine house floor. There are to be three horizontal tubular boilers, each five and one-half feet in diameter and sixteen feet long.

It is estimated that one hundred revolutions of the screws per minute will cause a discharge through the conduit of 24,000 cubic feet of water, in the same time, and that when doing such work each engine will be required to develop 145 indicated horse power.

The accompanying plans and sections on the opposite page are intended to illustrate the foregoing description.

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### WASHINGTON STREET RIVER TUNNEL.

To meet a want, occasioned by the destruction of the spare copies of the reports of the Board of Public Works by the fire of 1871, the following description of this work is taken from the Eighth Annual Report, pp. 137, —.

This structure is located with its centre line in the centre of Washington street. The eastern approach commences in the centre of Franklin street, and the western terminates in the centre of Clinton street. The grade at Franklin street is 11.5 feet, and the grade at Clinton street is 13.5 feet, above low water or city datum line.

The bottom of the tunnel, or top of invert, in the centre of the river, is 32.4 feet below low water. The grades be-

tween the ends of the approaches and the centre of the river are uniform, except 101 feet each way (east and west), from the centre line of the river, in which there is a rise of 2.33 feet.

The tunnel under the river consists of three passage-ways; the south one for foot passengers and the other two for horses and vehicles drawn by horses.

The south passage-way is 10.83 feet high between the bottom of the upper arch and the top of the invert. The width of this passage-way is 10 feet. The upper arch is struck from three centres, and the lower one, or invert, is a segment with a radius of 10 feet. The side walls are perpendicular from the springing line of the upper arch four feet down on each side of the footings, which project horizontally six inches, and then drop perpendicularly twelve inches, then project six inches, and then drop perpendicularly twelve inches to the invert.

The other passage-ways are eleven feet wide; their invert segments a radius of ten feet; their height, fifteen feet and three-quarters of an inch; their upper arches are struck from three centres. The perpendicular walls or piers between the passage-ways are two feet thick; the north abutment is five feet and the south abutment is four feet thick. The bottoms of the the middle walls are four feet thick. The bottom of the north abutment is six feet thick to the top of the invert skew back, and five feet at the footing. The bottom of the north pier is four feet thick, and the bottom of the south pier six feet thick; both are on a level with the bottom of the north abutment. The bottom of the south abutment is five feet one inch thick, and four feet two and one-quarter inches higher than the bottom of the north abutment. The inverts and upper arches are twenty-two inches thick. The backs of the abutments continue upwards perpendicularly to three feet above the springing line of the upper arches. Then a sloping flagging course com-

mences, and rises in six feet horizontal, to a point sixteen inches above the top of the outside of the upper arches. This flagging course, which is ten inches thick, is laid entirely across from one side to the other of the tunnel in the river, between the new dock walls, and the top of this flagging forms the bed of the river at this place.

The section of the tunnel above described extends entirely across the river, a distance of 222 feet. At the new dock line on each side the flagging course over the top of the tunnel terminates.

At a point 111 feet each way from the centre line of the river, the section of the tunnel changes to a single opening or passage-way, beginning here with a width of  $23\frac{1}{2}$  feet, and diminishing to a width of  $19\frac{1}{2}$  feet in a distance of 40 feet, or to points 151 feet on each side of the centre line of the river. At the points 111 feet each way from the centre line of the river, the centre of the passage-way begins with a height between the top of the invert and the bottom of the top arch of  $20\frac{1}{2}$  feet. The invert is 22 inches thick, and laid to a radius of 23.83 feet. The foundations of the abutments are eight feet broad to a height of five feet two inches. The footing course above is 12 inches high and seven and one-half feet broad. The abutment then rises perpendicularly seven feet, and is seven feet thick. The upper arch is struck from three centres, with a total height above the springing lines at this point of nine feet. The thickness of the upper arch is 34 inches on the sides and 26 inches on top. The spandrels of the upper arch are backed with rubble masonry.

At the points 151 feet each way from the centre line of the river, the centre of the passage-way has a height of 18.83 feet between the top of the invert and the bottom of the upper arch. The invert, which to this point is 22 inches thick, is here reduced to 18 inches thick. The abutments are seven feet two inches thick at the bottom, and for three feet four inches up; then seven feet

for 12 inches up; then six and one-half feet for 12 inches up; and then six feet for seven feet up. The upper arch is struck from three centres, with a total height above the springing line of seven and three-quarters feet. The upper arch is 30 inches thick on the sides and 22 inches on the top. The spandrels are backed with rubble masonry. The section of the tunnel just above described extends from the point 151 feet east of the centre line of the river, to a point  $269\frac{3}{4}$  feet further east, or  $420\frac{1}{4}$  feet from the centre line of the river, and the remainder of the approach to the tunnel is open at the top, extending to the west line of Franklin street, a further distance of 273 feet, with side walls continuously diminishing in height and width of base. These walls are 25 feet high above the bottoms where they join the covered passage-way, and eight feet high on the west line of Franklin street, where they terminate. The bottom width of the walls is four feet at the west line of Franklin street, and eight and three-quarters feet at the other end. The top width of each wall is everywhere two feet. The face of each wall is perpendicular, and the back is carried up in steps.

From the point 151 feet west of the centre line of the river to a point 362 feet further west, or 513 feet from the centre line of the river, the section of the passage-way is uniform throughout. At this point the uncovered passage-way or approach to the tunnel begins, and continues to the east line of Clinton street, with side walls, the same in all respects as those on the eastern approach to the tunnel, except in length, which is 320 feet.

There is a wall on the east side of the river at the dock line 50 feet, and one on the west side 80 feet, long. These walls are of rubble masonry, six and one-half feet thick at the bottom, and three feet thick at the top, and are carried up eight feet above low water. They are 200 feet apart, to provide for prospective widening of the river. At the eastern and western ends of the covered passage-way there is a face wall extending up to the

grade or surface of the street above of cut stone, rock faced ashlar, with chisel-dressed margins.

Through each of the middle walls or piers of the tunnel there are eleven openings, each three feet wide.

There is under the north passage-way, and near the lowest part of the tunnel, a well five feet in diameter and 15 feet deep. This well is connected, by means of a four foot brick sewer 100 feet long, with a well five feet in diameter and 13 feet deep. The wells are of brick masonry with walls eight inches thick, and inverts of the same thickness, depressed four inches in the centre. The sewer and wells are built in concentric rings, four inches thick, with a half inch mortar joint between them. Outside of the sewer and wells, and entirely around them, there is a coating of cement mortar one inch thick. The spaces between the excavation and sewer and wells, and above the sewer to the bottom of the invert, are filled in with concrete. The character of the bricks, mortar and cement, and the work of laying them, are the same as employed for the tunnel. The well near the centre of the tunnel drains the foot-passenger way, through a nine inch hard-burned clay pipe laid in cement. The well at the east end of the tunnel, under the river section, is further carried up to the surface of the street in the form of a shaft in the stone abutment, from which shaft the water that collects in the well is pumped up by machinery, constructed for that purpose, within the chamber built at the top of the shaft. The chamber is built of rubble masonry, and its interior dimensions are 12 feet by 10 feet.

Broken-stone drains are built at every 20 feet, at the back of the abutments, and are carried through the abutments to four inch drain pipes, to receive the water that collects from the surface above. These four inch drain pipes discharge into a nine inch pipe sewer, built or laid on the top of the inverts, which discharges into the well near the centre of the river.



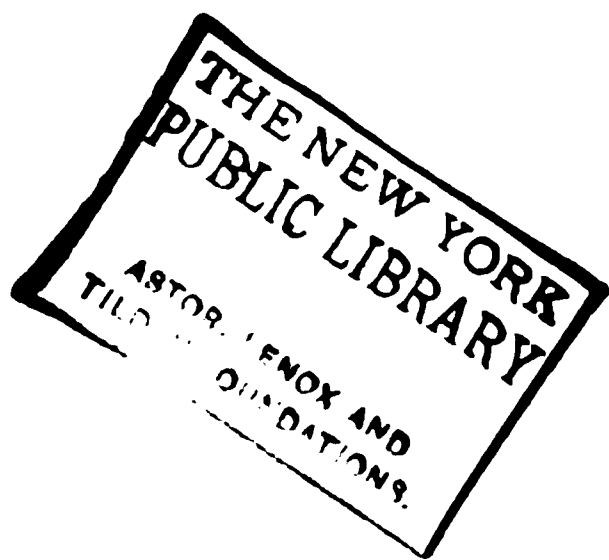
Between the bottoms of the stone stairways, on each side of the river, in the foot-passenger way, there was a pine plank pavement four inches thick, laid lengthwise and resting on joists four by eight inches, placed once in every five feet, the whole distance, including the stone platforms, being 811 lineal feet. Since then this flooring has been lowered and the planking laid cross-wise.

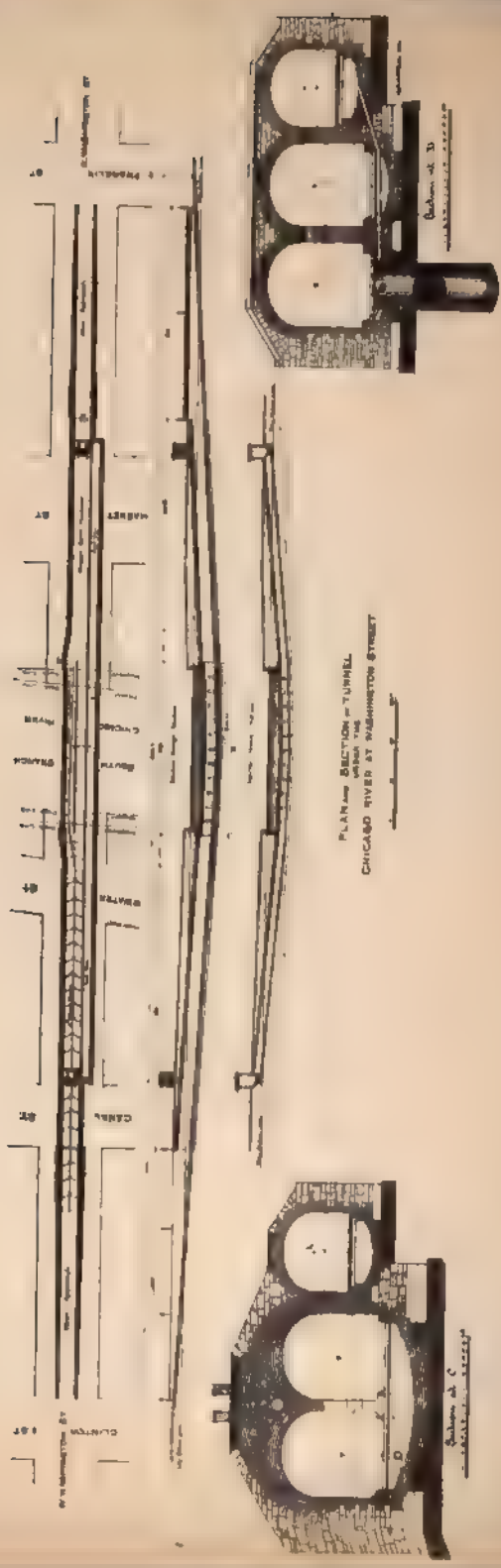
The open approaches to the tunnel, on each side, and the passage-way for horses, are paved with wooden block pavement (the whole distance being 1,608 lineal feet), resting on lake shore sand.

The foundations every where under the tunnel, including all the covered arch-ways, are of concrete, made by thoroughly mixing one measure of hydraulic cement with three measures of clean sharp sand, in a dry state, and then mixing with the cement and sand, water enough to make good mortar. Then with the mortar were incorporated five measures of broken stones, and the whole mass worked until the broken stones were uniformly distributed throughout. The concrete was then laid in beds and rammed with wooden rammers.

The masonry is constructed of brick in the invert, upper arches, piers above the invert, and the faces of the abutments, to an average thickness of 12 inches. It is constructed of stone in the bottoms of the piers and abutments, in the backs of the abutments, and in the spandrel backing of all the arches.

The invert and upper arches are built in shells or parts of rings four inches thick, with a floated joint of cement mortar between the shells of one-half an inch thick. The bricks in each course of the arches are stretchers, and laid so as to break joints with the bricks in the adjoining courses. The brick masonry in the faces of the abutments is bonded into the stone masonry by projecting into it eight inches further every other





PLAN and SECTION of TUNNEL  
UNDER  
CHICAGO RIVER AT WASHINGTON STREET

belt of five courses than the intermediate belts, thus making the brick work eight inches and sixteen inches in alternate belts.

The arches are covered with asphalt mastic, mixed with five per cent. of prepared mineral bitumen, laid on a bed of lime mortar, then covered over with lime mortar five-eighths of an inch thick. The asphalt covering is from half an inch to five-eighths of an inch thick, and was laid on hot from the kettle, and well floated and jointed.

Two ventilators, one on the east side of the east dock wall, and one on the west side of the west dock wall, are carried up to the level of the street. The internal diameter of each is two feet, with a thickness of wall of 16 inches of brick work.

The grade of the tunnel is one in 16 feet on the east side, and one in 18.626 feet on the west side. The grade of the passenger-way is one in 11.306 feet on the east side, and one in 12.076 feet on the west side. The grade east and west under the river is one in 42.863 feet, for both the main passages and the foot-passenger way.

The entire width of Washington street is 80 feet. The sidewalks on each side of the street, near the open approaches, were reduced to 10 feet in width each; this left a carriage-way 18 feet wide on each side of the open approach.

The accompanying illustrations, it is believed, need no further explanations.

The leakage, which was so annoying at first, through the masonry into the drive and foot-ways of this tunnel, gradually became less and less, until now it is, in actual amount, as shown by the ordinary pumping required, not one-tenth of what it formerly was; and the large icicles, which at first had to be cleaned out from time to time during the winter, rarely give any trouble now. This is mostly, if not altogether, due to

changes in the cement joints, first caused by solution, and then by deposition of carbonate of lime.

The contractors who executed this work were Messrs. J. K. Lake, Chas. B. Farwell, and A. A. McDonnel. They commenced operations July 25th, 1867, and the tunnel was opened to public use January 1st, 1869. Mr. William Bryson, assistant engineer, had the immediate charge of the work. A history of the preliminary proceedings and occurrences from the first suggestion concerning it, to the final construction of this work, including an account of the coffer dams used, will be found in the Eighth Annual report, pp. 129—153.

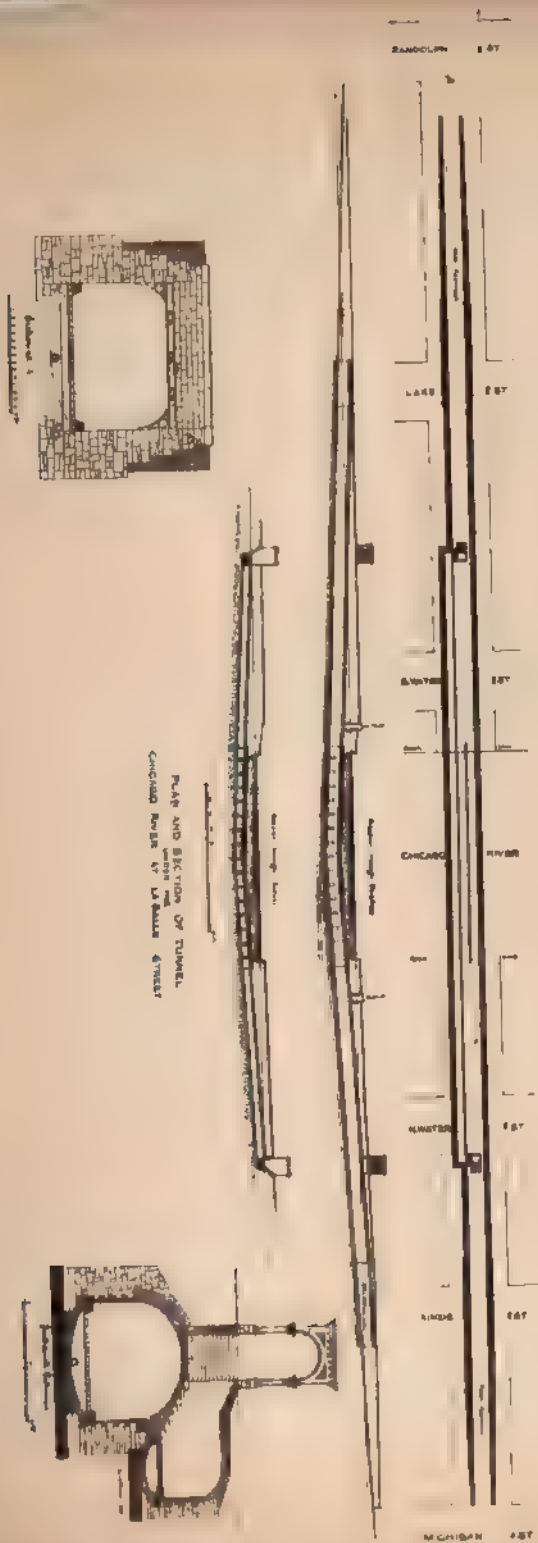
This and the La Salle street river tunnels were not constructed by tunneling proper, but in open cutting and coffer dams, a little more than one-half the river being obstructed to navigation at a time.

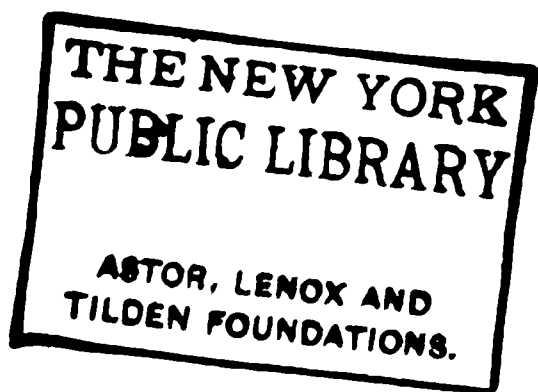
The total cost, up to October 31st, 1869, of work done by the contractors, was \$395,664.48; and of all other items, including preliminary expenses, superintendence and contingencies, discount on books, damages and miscellaneous matters, \$117,043.09. Total, \$512,707.57.

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### LA SALLE STREET RIVER TUNNEL.

A full description of this tunnel would be almost a repetition of that of the Washington street river tunnel. Mention will therefore be made only of the differences of plan and construction. By referring to the accompanying drawing it will be seen that the maximum grade of the drive-way of this tunnel is one in 20, and that of the foot-way 1 in  $14\frac{1}{3}$ ; that the foot-way is 12 feet high; that the entire length of the tunnel is 1,854 feet—of the river portion 276 feet, and of the covered approaches





1,040 feet. Lake and Kinzie streets cross the ends of the covered approaches on wrought iron girders and brick arches. This was done in order to avoid injuring the property east and west, by raising the grades of those streets, which would otherwise have been necessary.

Instead of depending upon a simple coating of asphalt over the masonry under and near the river, the two upper rings under the river were laid in asphalt instead of cement. At first the bricks were slightly heated, to insure a full joint, but this process was soon abandoned, on account of the difficulty of keeping the masonry in position until the bricks cooled sufficiently to harden the asphalt. The success which attended this effort to avoid the unpleasant and objectionable amount of leakage that showed itself the first two or three years in the Washington street river tunnel, was very gratifying. The arches under the river have been remarkably dry, for such work, from their completion to the present day. Under the north dock wall a defect in the asphalt work exists, and this has caused large icicles to be formed there every winter. Each way from the river, on account of the costliness of such material, less asphalt was used, and a less perfect result was obtained than under the river; nevertheless, with the exception of under the north dock wall, no unpleasant drippings have occurred, only damp patches, which are much worse after heavy or long continued rains than in dry weather.

The foot-way is two feet higher in the clear than that of the Washington street river tunnel, and the planking was placed crosswise from the first.



## OUTSIDE HARBOR.

During the war, the city paid for the necessary pier-extension and dredging to keep open the entrance to the harbor. Before and since then the U. S. Government has paid all the expenses of such work, as will be seen by the following, taken from the report for 1876 of Col. G. L. Gillespie, U. S. Engineer, in charge of the harbors of the southern portion of Lake Michigan:

## HISTORY OF THE WORK TO THE YEAR 1875.

“The work of improvement at this harbor was commenced by the United States Government in 1833. Previous to this the Chicago River made a sharp bend southward, near the present depot of the Illinois Central Railway Company, and had its outlet into the lake fully half a mile from the bend, leaving between the river and the lake a long sand-bar above water, formed by the action of the northeasterly gales. The work of improvement was commenced by giving the river a straight outlet by a cut through this bar, and by constructing a pier on the north bank. The direction of this pier was about east by south, and its length about 1,000 feet, beginning nearly at the then shore-line. A pier was also constructed on the south side of the river, running parallel to the pier above mentioned, through which at a latter date cuts were made by the Illinois Central Railway Company, forming ship-basins in connection with their other improvements. No data is available to define the date of the construction of the south pier. In 1836 or 1837, the north pier was extended 400 feet and its direction changed to about east by north. This change, however, proved unfavorable, as a sand-bar soon formed in the channel south of the east end of the pier. This suggested a return to the direction given to the first part of the pier, and in the construction the change was made gradually by building the pier in a curve to which the preceding pier would be a tangent, and ending in the direction de-

sired. This work was done about 1838 to 1840, and in 1852 a pier-head was built at the outer extremity to be used as a foundation for a light-house. The light-house, however, was, in 1859, constructed on piles, at a point about 50 feet farther north. It is of iron, painted black, and is 75 feet high, or 83 feet above the lake-level. The light is fixed, and visible 15 nautical miles. The change in the direction of the last-named extension proved quite a success. This fact, however, seems to have been ignored or forgotten when in 1865 the city extended the north pier a length of 450 feet, adopting again the more northerly course, which the work of 1836 and 1837 had proved to be unfavorable.\*

"The improvements at this harbor carried on by the Government from 1848 to 1854 were under the superintendence of Lieut. J. D. Webster, Corps of Topographical Engineers. While Lieut. Col. J. D. Graham was in charge of this harbor-improvement, [December 11, 1856, to April 20, 1864.] the privilege was granted the Chicago Canal and Dock Company by the War Department—

"To make an opening through the United States north pier, to communicate from this harbor with ship-basins and canals, which the said company proposed to construct within certain grounds owned by it immediately north of and adjacent to said pier.

"A map accompanying the annual report of the Board of Public Works of Chicago for 1864 shows a channel in the mouth of the river of 10 to 12 feet, and a bar, about 800 feet east-south-east from the light house, covered by only 8 feet of water. These depths are referred to the water-level of that date, which was 2 feet higher than that of low water of 1847, and this level [of 1864] was fixed by the city as the plane of reference for the Board of Public Works in all their operations. The shore-line at this time, on the north side of the north pier, reached a point on this pier about 250 feet westward from the

\* The direction given to the portion of the pier built by the city was in accordance with the recommendation of Col. Cram U. S. Engineers then in charge of this and other lake harbors.

light-house tower. This shore-line has steadily increased outward every year. A map of August, 1865, found with the annual report last mentioned, shows a channel of 13 to 14 feet at the mouth of the river, and a sand-bar covered by 6 feet of water for a length of 1,000 feet in a southerly direction, with a width of 150 feet, and at a distance from the north pier of about 1,200 feet. The depths on this map are also referred to the water-level of 1864, established by the Board of Public Works.

“Col. Thomas J. Cram, in charge of the harbor-improvements in Lake Michigan from October, 1864, to August 3, 1865, recommended the extension of the north pier 600 feet. and the rebuilding of the south pier so as to extend it 610 feet. The estimated cost of the whole work was \$88,704. This sum was appropriated, but the estimate was made to cover only 490 feet of the north pier extension, it being expected that the remaining 110 feet would be constructed by the city authorities. June 11, 1866, Maj. J. B. Wheeler, United States Engineers, was placed in charge of the improvement. In his annual report, dated September 1, 1867, he says:

“The Government has made no recent surveys of this harbor. In August, 1866, a contract was made to extend the north pier 600 feet. The work was not commenced until this year.

“W. B. Ogden, Esq., President of the Chicago Canal and Dock Company, in a letter addressed to Major Wheeler, dated June 29, 1867, presented certain “plans for enlarging and improving the Chicago Harbor, in connection with the proposed extension of the north pier by the Government.” These plans, which were transmitted by Major Wheeler, July 2, 1867, to the Chief of Engineers, and by him approved, contemplated simply throwing the initial point of the new extension 300 feet farther out into the lake, so as to leave an open space of equal length east of the old pier as an entrance to an enlarged ship-basin proposed to be constructed by the dock company on the north side

of and adjacent to the river-channel. Major Wheeler says further, in his annual report of this year:

“This arrangement is advantageous to the Government, for it virtually extends the pier 900 instead of 600 feet; the crib-work inclosing the basin effectually preventing any wash through the opening from the north—the direction of all the severe winds, and where the drifting sand and gravel come from. This extension reaches water 24 feet deep. \* \* \* I do not believe that any bar will be formed at the end of this pier for many years.

“Only 96 feet of the work were completed during the fiscal year ending June 30, 1868, due to the delay occasioned to the contractors by the building of the basin of the Chicago Canal and Dock Company. The bar at the mouth of the harbor increased considerably during the winter of 1867-'68, owing, in a great measure, to the Chicago Canal and Dock Company not enclosing their basin in time, according to agreement. The amount of increase was estimated at a little over 4,000 cubic yards.

“A little over 3,000 cubic yards were dredged during the year. No appropriation was made for this year. To continue the improvement by extending the south pier, an appropriation of \$48,000 was asked for the following year.

“Amount allotted during the year 1868-'69, \$35,000.

“The north pier was fully completed, the end of the pier being in water 23 feet deep. The building of the south pier and its extensions as far as the light-house pier was contracted for, the estimated cost of this work being \$42,000. Surveys were ordered to be made, and projects prepared, with a view to affording greater safety to the commerce of this harbor.

“Amount allotted during the year 1869-'70, \$30,000.

“During July and August a survey of the harbor entrance and lake front of the city was made by Major Wheeler in obedience to instructions from the Chief of Engineers. The map, on a scale of one inch to 400 feet, showed the condition of the

bar, the harbor entrance, the various improvements, and the water-front of the city from about three-quarters of a mile north of the entrance to a point one and one-quarter miles south. In a letter to the Chief of Engineers, dated November 30, 1869, Major Wheeler, after noticing the rapid increase of the commerce of the harbor since 1854, and the influence upon the port of the numerous railroads centering in Chicago, says:

“The greater depth of water over the St. Clair flats, and the enlargement of the Welland Canal, that may be confidently expected at some future time, will make the question of direct trade with Europe a practical one. A steamboat canal connecting this port with the Mississippi River is only a question of time. These two possible events, taken in connection with the railroad system now in existence, convince me that the commerce of this port will, at no distant day, far exceed its present proportions. We therefore may assert it as an axiom that harbor facilities of the best and most secure kind become a matter of absolute necessity for the present vast extent, and rapidly increasing growth of the commerce of Chicago. \* \* \* In a commercial point of view Chicago ranks very high, probably the third or fourth port in the United States. It is manifest that the Chicago River is taxed to its utmost to accommodate the present condition of affairs, and that it is utterly inadequate to meet the want of commerce rapidly growing. \* \* \* My plan would be to continue the work on the extension of the south pier until it is equal in length to the north pier; then build a breakwater at right angles, and extending southward for 4,000 feet, and then join the extremity of this breakwater to the shore with a pier; an opening 300 feet or more to be left in the pier forming north side of the basin, to admit vessels from the harbor-entrance. This basin would contain an area of 275 acres, one-third of which would contain a depth of over 12 feet water, and the remainder a depth of over 7 feet, that can be easily deepened to 12 feet, affording a splendid harbor of refuge for all classes of vessels sailing to and from this port at the present time.

“The total estimated cost, in round numbers, of this improvement was \$900,000, inclusive of \$300,000 for dredging in the basin.

“A Board of Engineers, consisting of Col. J. N. Macomb, officiating as president of the Board; Lieut.-Col. W. F. Reynolds, brevet brigadier-general, U. S. A.; Maj. J. B. Wheeler, brevet colonel, U. S. A.; Maj. G. Weitzel, brevet major-general, U. S. A.; Maj. Walter McFarland, convened at Chicago January 18, 1870, in pursuance of Special Orders No. 1, dated Headquarters Corps of Engineers, Washington, D. C., January 5, 1870, to

consider certain harbor improvements on Lakes Superior and Michigan.

"After making a personal examination of Chicago Harbor, the Board adjourned to meet at Milwaukee on the 19th of January. A letter of instructions relating to Chicago Harbor from the Chief of Engineers, dated January 5, 1870, for the guidance of the Board, reads as follows:

"The Board will take into consideration the plans submitted by Brevet Colonel Wheeler for the outer harbor of Chicago, and report upon the necessity, proper location, and mode of construction of such a harbor; and, in connection with the subject of additional facilities needed for the security of the commerce of that city, will take into consideration the relation of the Calumet River to the harbor of Chicago, the feasibility of improving the mouth of that stream, and whether it is practicable to use the Calumet for the purpose of affording additional facility to commerce, taking into consideration not only the present trade of Chicago, but that which may be reasonably expected in the near future.

"After a careful examination of the subject the Board made the following report.

"The Board is unanimous in the opinion that great necessity exists for the construction of an outer harbor at this place, and approves the location and method of construction recommended by Colonel Wheeler, suggesting, however, that the construction of the south or closing pier of the proposed harbor be deferred until the effect upon the bottom, by the construction of the breakwater, is observed, and the necessity for such a pier is shown. \* \* \* The board is of the opinion that the improvement of the Calumet River will not afford the relief needed by the crowded commerce of Chicago, and therefore recommends no plan for this purpose, the plan of an outer harbor already recommended being capable of any extension demanded by the future commerce of the city.

"During the year the south pier was commenced and extended. One thousand two hundred and twenty-four feet of cribs were put in, but only 614 feet of superstructure constructed. Soundings taken in July and August of this fiscal year showed a channel of 13 to 14 feet.

"Major Wheeler was relieved from duty February 21, 1870, and Maj. William E. Merrill was in temporary charge until May 3, 1870, when he was relieved by Maj. D. C. Houston, United

States Engineers, by Special Order No. 102, dated Headquarters of the Army, May 3, 1870.

“Amount allotted during the year 1870-’71, \$100,000.

“The construction of the breakwater for the outer harbor was commenced in September, 1870, and 23 cribs, each 50 feet long and 30 feet wide, were sunk at the close of the working-season; the first crib being placed at a point 970 feet due east from the east end of the south pier, and 477 feet south from the east end of the north pier. In the spring of 1871 six cribs, of the same dimensions, were sunk on the return at the north end of the breakwater, making 29 cribs sunk during the fiscal year, over a running length of 1,450 feet. The first crib was placed in 24 feet of water. No cribs were placed in less than 18 feet, and when necessary to obtain that depth, dredging was resorted to. On May 30, 1871, a contract was made with the Illinois Central Railway Company for constructing the work under the appropriation for the following fiscal year.

“Amount allotted for the year 1871-’72, \$100,000.

“During the year the breakwater was extended 800 feet, and the superstructure was completed over the 1,150 feet of the crib-foundation put in the previous year. There were completed, at the close of the fiscal year, 2,250 feet of the breakwater, including superstructure nearly finished, at a total cost of \$200,000, or \$88.88 per running foot. The channel, in November of 1871, had 13 feet of water. Major Houston, in letters to the Chief of Engineers, dated November 29 and December 21, 1871, discussed in detail the subject of sinking cribs directly upon sand, and the causes leading to their displacement, and recommended the use of foundations of loose stones in the Chicago breakwater. Under date of February 5, 1872, the Chief of Engineers approved his recommendation in the following language :



“For the reasons given, and in accordance with your recommendation, you are authorized to so far modify the project as to introduce the stone foundations for the cribs used in the breakwater, the cross-section and dimensions of the foundation to be such as your judgment and experience may dictate. It is not deemed advisable to have the top of the stone foundation approach nearer to the water-surface than 12 feet.

“The new foundations were subsequently used, and proved very successful in preventing undue settlement of the cribs. Clumps of piles were placed during the year around the north end of the breakwater to protect it from damage by vessels.

“The channel had a depth of 13 to 14 feet of water in February.

“Amount appropriated June 10, 1872, \$90,000.

“The breakwater was extended southward 800 feet, and the superstructure completed, except the west half of the decking, for a distance of 2,250 feet. At the close of the fiscal year, 3,050 feet of breakwater were completed, including the return of 300 feet at the north end. Referring to the possible extension of the breakwater beyond the projected limits, Major Houston says, in his annual report, that the construction of the south pier to enclose the projected basin—

“Would be not only unnecessary but injurious to the harbor. The decision of the question depends upon whether the lake-front is to be used for dock purposes. If not, then the basin as designed will, it is believed, meet all the requirements of a roadstead for many years.

“A matter of more immediate importance to the interests of this harbor is the extension of the north pier.

“The north pier extension is also mentioned in a letter of the superintendent to Major Houston, dated April 15, 1873, in the following language:

“The works on both sides of the entrance to the river are out an equal distance into the lake, and during north, northeasterly and northwesterly blows, a heavy sea rolls in along the return and into the entrance to the harbor basin formed by the breakwater, making it difficult, and at such times dangerous, to take out stone and other materials to the works. \* \* \* At such times, too, the sea strikes the return and is deflected across and into the slip at the north pier, making difficult navigation



from east of the light-house, especially where the water is 14 feet deep and less, as loaded vessels are likely to strike. I think it probable the shallowing of the river is caused by deposit during gales, *i. e.*, a deposit of sand and other material is made just where the water becomes comparatively smooth. Adding to the return would not prevent the rough sea between the north pier and it, and only partially give protection to the entrance into the basin or harbor, while it would injure materially, by narrowing, the entrance. Lengthening the north pier 400 or 500 feet would afford all the safety needed to docks inside the basin, and would save the present width between the return and end of south pier, and make it comparatively easy for vessels from outside to sail into the outer harbor or basin.

“Amount appropriated for the year 1873-'74, \$75,000.

“The breakwater was extended southward 1,100 feet. No superstructure was added during the year. A few protection-piles, carried away by the ice at the north end of breakwater, were replaced. At the close of the fiscal year the foundation-cribs of the breakwater were sunk for a distance of 4,150 feet inclusive of the return, and the superstructure was completed for a distance of 2,250 feet. Lieutenant Hinman, United States Engineers, in his report to Major Houston, dated May 13, 1874, says:

“During July and August, 1873, the harbor was accurately surveyed by myself. The survey embraced that portion lying within the prolongation of VanBuren street (the line of the proposed south pier), the line of the lake tunnel, the 25-foot curve, the shore-line, and a line drawn across the river near the Illinois Central Railway elevators. The survey disclosed few important changes, except that the shore-line north of the north pier was advancing. It is believed that vessels find plenty of water in that portion of the river covered by the survey.

“The main channel showed an average of 14 feet of water.

“Major Houston was relieved from duty in connection with this harbor by paragraph 2, Special Orders 140, War Department, Adjutant-General's Office, Washington, June 26, 1874, and Maj. G. L. Gillespie, United States Engineers, placed in charge.

“Major Houston, in his annual report dated September 8, 1874, says, in reference to building the south pier inclosing the outer basin:

“ It should not be undertaken until the question of occupying the lake-front for wharves is definitely settled. In my last annual report I submitted an estimate for extending the north pier, which I consider of more immediate importance to this harbor than any other work.

“ The entrance-channel has been but little obstructed for the past three years by accumulations of sand from the outside. The last survey, which was made in November, 1874, shows that by existing works a good channel of about 15 feet has been maintained inside, opposite the main light, and that, opposite the beacon in the channel between the north-pier extension and the breakwater, the depth is as great as 22 feet. The shoaling beach north of the north pier is not uniform on its surface, due to the irregular currents, but is gradually moving outward. Its rate of advance is not great enough, it is believed, to cause the formation of a bar near the mouth of the river for many years. At the time the Government commenced this improvement the outlet of the river had been closed for many years by a bar which was visible above the lake level at certain stages.

“ The bar was partially cut away during spring freshets, only to be re-formed during the fall. To-day there is a good channel of 15 feet of water at all stages.”

## DEATH OF MR. BRYSON.

Mr. William Bryson, who died October 5th, 1876, had been connected with the Public Works nineteen years, excepting from 1863 to 1867, when he was employed by the general government on important fortifications. While engaged upon the sewers of the city he gave such satisfaction by his accuracy and methodical course, that he was afterwards employed to prepare the working plans for, and take the immediate charge of the Washington street and the LaSalle street river tunnels, the new lake tunnel, including the land extension of the same, the new Lake Tunnel Crib, and the foundation of the West Side Pumping Works. Mr. Bryson's ideas were incorporated into many of the details of these works, especially in architectural matters, for which he possessed talent and taste not often found among engineers.

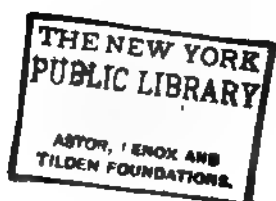
Respectfully submitted,

E. S. CHESBROUGH,

*City Engineer.*

# Sketch Map of CHICAGO and Vicinity





## STREETS, BRIDGES AND PUBLIC BUILDINGS.

CHICAGO, January 2, 1877.

HON. M. HEATH, *Mayor,**In charge Department of Public Works :*

SIR:—The sixteenth annual report of this department is herewith respectfully presented. Less work has been done during the year past than any year since the great fire; with the exception of paving streets, of which work an average amount [eleven miles] has been done, principally by private contract between property owners and contractors, the city controlling the work in a certain degree.

No new bridges have been built. The work on Harrison street bridge has not been resumed, the difficulty regarding land damages not having been adjusted. The iron superstructure is completed, and can be placed in position in thirty days.

A viaduct has been built at Blue Island avenue and Throop street, over tracks of the C. & N. W. and C., B. & Q. railways.

The construction of the masonry, filling, and a portion of the paving, and the superstructure of the Milwaukee avenue viaduct has so far progressed that its completion may be looked for by April 1st.

The bridge at Fuller street was thrown down and destroyed by a gale on the 5th of May last. This was an old wooden structure, built in 1865, at a cost of \$7,500, and would have been replaced a year ago but for lack of an appropriation. Plans for a new iron bridge, also for a combination bridge have been made, bids advertised for, and proposals for the work re-

ceived. The bridge can be built in sixty days, providing an appropriation is made.

For details regarding bridge repairs, I refer you to the following report of Mr. Bramhall, bridge foreman.

CHICAGO, December 30, 1876.

GEO. W. WILSON, ESQ., *Superintendent*,

SIR:—I herewith submit my annual report of repairs on bridges, viaducts and docks, ending with this date.

The draw bridges are all in fair condition with the exception of those at North Halsted street and North avenue, which were reported with Fuller street bridge one year ago, as being worn out and unsafe. Fuller street bridge broke down upon the 5th of May, proving the correctness of the report. North Halsted and North avenue bridges cannot be depended on with any degree of certainty, for any great length of time after the opening of navigation, as the danger is not so much while in position for travel, as it is of breaking down while being swung.

Kinzie street bridge approaches were repaired, and to a certain extent rebuilt by building a retaining wall on the east side, which supports the rear end of the approach; a timber bedded across the street, back of the wall 25 feet, and the pile bents anchored back with one inch tie rods. On the west side new caps were put on the outside bents and anchored back with tie rods to old piles formerly used for the old float bridge, and sheet piling driven on both sides to protect the approaches and sewers. New sidewalks were laid on both approaches. State street bridge center and turn-table wheels gave out and had to be

renewed, at a cost of \$800. The centre protection was repaired in the north draw by driving 10 forty-foot piles, and extra timbers bolted on the outside.

Adams street centre protection was rebuilt, and three courses of 6 x 12 timber bolted on the outside of the piling to strengthen it, and make it lasting and secure. Fender clumps should be driven at each angle or hip of the protection.

South Halsted street centre protection was thoroughly rebuilt, and clumps of fender piles driven at the angles to guard the protection and bridge. 21 forty-foot piles were driven.

The following bridges were replanked during the season: State, Kinzie, Lake, Van Buren, and Archer avenue, with the approaches of the latter. South Halsted street viaduct has been replanked and strengthened, by placing 3 x 12 wooden floor beams hung in wrought iron stirrups between each of the iron beams, and well bridged, and 4 x 6 pine stringers laid on top and cross planked, making the roadway capable of sustaining any weight equal to the strength of the truss. The sidewalks were likewise put in good repair.

Indiana street viaduct is now undergoing a thorough overhauling. The bottom chords began to show indications of age and weakness, they were secured by placing four wooden columns, 14 x 14 inch square posts, under each span and well keyed up. Plank and stringers are on the ground for replanking. When the repairs are completed, it will be in good and safe condition, and will need no further attention for three years.

No estimates were made for any of the viaducts last year except South Halsted and Indiana street: the supposition being at the time the estimates were made up that the street department would take care of all temporary or ordinary repairs, instead of which the bridge department has had to take care of all the viaducts.



At Madison street, the heavy iron railing, which was in a broken condition, was taken off and substituted with a light wooden rail, much to the advantage of the bridge. New sidewalks were also laid. Lake street viaduct was replanked entire. Canal, Twelfth, Adams, Randolph, Wells, Clark and State street viaducts all received quite extensive repairs.

It was found necessary to do considerable sheet piling at several of the bridges for protecting approaches, bridge houses and sewers. The expenditures on river bridges, viaducts and docks has been as follows:

Rush street bridge.....	\$ 358.53
State street bridge.....	1951.77
Clark street bridge.....	305.07
Wells street bridge.....	328.77
Lake street bridge.....	785.48
Randolph street bridge.....	432.35
Madison street bridge.....	342.06
Adams street bridge.....	1031.47
VanBuren street bridge.....	655.16
Polk street bridge.....	331.41
Twelfth street bridge.....	349.52
Eighteenth street bridge.....	292.51
Twenty-second street bridge.....	588.00
South Halsted street bridge.....	1143.20
Main street bridge.....	788.90
Archer avenue bridge.....	722.51
Douglas Place bridge.....	149.40
Fuller street bridge.....	312.13
Ashland avenue bridge.....	201.64
Western avenue bridge.....	190.83
Kinzie street bridge.....	808.53
Indiana street bridge.....	244.31
Erie street bridge.....	433.45

Chicago avenue bridge .....	634.93
North Halsted street bridge.....	331.96
Ogden canal and Halsted street.....	206.45
East Division and Halsted street.....	509.82
West Division and Halsted street.....	540.44
North avenue.....	458.70
Clybourn place.....	282.45
Ashland avenue Pile bridge.....	114.50
Lock or Canal bridge.....	24.00
Fullerton avenue.....	15.00
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	\$15,864.85

## VIADUCTS.

South Halsted street.....	1,278.37
Canal and Sixteenth streets.....	72.00
Twelfth and Beach streets.....	42.98
Adams street.....	35.50
Madison street.....	181.49
Randolph street.....	38.95
Lake street.....	120.97
Wells street.....	85.50
Clark street.....	33.42
State street.....	337.75
Indiana street.....	1,420.01
Milwaukee avenue.....	337.41
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	\$3,984.35

## DOCKS.

Kinzie street.....	96.00
La Salle street.....	133.03
Adams street.....	70.08

Main street.....	80.10
Archer avenue.....	120.00
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	\$499.21
	<hr/>
Total.....	\$20,348.41

Respectfully submitted.

G. R. BRAMHALL,

*Foreman of Bridge Repairs.*

The itemized account for repairs on bridges and viaducts is as follows:

Foreman and labor.....	\$9,564.47
Coal.....	510.10
Tools and hardware.....	74.48
Lumber.....	6,166.01
Iron work.....	1,358.23
Castings.....	64.94
Brooms, matches and small stores.....	77.50
Rope and oars.....	87.70
Lanterns, wick, etc.....	49.38
Nails and spikes.....	543.18
Oil.....	394.01
Bolts.....	143.46
Stores and repairs.....	36.90
Use of tugs.....	129.00
Dredging.....	75.00
Rent of lot at Erie street.....	450.00
Driving piles.....	498.00
Repairing chimney.....	7.25
Oakum.....	39.55
Stone.....	62.75
Filling approaches.....	17.00
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Total cost.....	\$20,348.41

This amount is credited by amount collected for damages by vessel..... \$12.50  
 Amount paid by C. & N. W. R'y for one half expense of keeping State-street viaduct in repair, (2 years)..... 800.00 \$812.50  
 True cost..... \$19,535.91

For convenience of reference, tabular statements of bridges and viaducts are here recorded.

TABULAR STATEMENT OF BRIDGES  
 MAIN RIVER

LOCATION	MATERIALS			CONTRACTOR	When Constructed	Length	Cost
	Superstructure	Center Pier	Abutments				
Rush st	Iron	Stone	Stone	Harper & Tweedale	1856	211	574,000
Rush st, rebuilt	Wood	Stone	Stone	Fox & Howard	1864	211	8,900
Rush st, rebuilt	Iron	Stone	Stone	Detroit Bridge Wks	1872	211	15,600
	Substructure						8,874
State st	Wood	Piles	Piles	Fox & Howard	1861	181	32,000
State st, rebuilt	Iron	Stone	Stone	Keystone Bridge Co	1872	181	22,500
	Substructure	Stone	Stone				27,000
Clark st	Wood	Piles	Piles	Chapin & Co	1857		
Clark st, rebuilt	Combination	Piles	Piles	Thos. MacMill	1866	180	14,200
Clark st, rebuilt	Combination	Stone	Stone	Fox & Howard	1872	180	32,000
Wells st	Wood	Piles	Piles	Harper	1866	190	
Wells st, rebuilt	Wood	Piles	Piles	Fox & Howard	1862	190	5,200
Wells st	Iron	Stone	Stone	Fox & Howard	1872	190	22,400
	Superstructure	Stone	Stone	Fox & Howard	1872		20,182

SOUTH RAVINE

LOCATION	MATERIALS			CONTRACTORS	When Constructed	Length	Cost
	Superstructure	Center Pier	Abutments				
Lake st	Wood	Piles	Stone	N. Chapin	1860	185	
Lake st, rebuilt	Combination	Piles		Fox & Howard	1868	185	\$11,450
Lake st, approaches	Iron		Stone	Fox & Howard	1875	458.48	
Randolph st	Wood	Piles	Piles	L. B. Bonner & Co	1864	153	5,000
Randolph st, rebuilt	Iron	Piles	Piles	Keystone Bridge Co	1874	157	
Madison st	Iron	Stone	Stone	Crayford	1857	155	42,000
Madison st, rebuilt	Iron	Stone	Stone	Acadian Bridge Co	1875	157	
Adams st	Combination	Piles	Stone	Fox & Howard	1869	160	37,950
Adams st., rebuilt	Iron	Stone	Stone	Keystone Bridge Co	1872	160	14,000
	Substructure						31,204
Van Buren st	Combination	Wood	Stone	Fox & Howard	1867	163	18,270
Van Buren st, rebuilt	Combination	Stone	Stone	E. Sweet, Jr & Co	1872	163	15,200
Polk st.	Combination	Piles	Piles	Fox & Howard	1869	154	29,450
Polk st., rebuilt	Iron	Stone	Stone	K. & Iron Bridge Co	1872	154	12,025
Twelfth st	Combination	Piles	Piles	Fox & Howard	1868	202	44,050
Eighteenth st	Combination	Piles	Piles	Fox & Howard	1868	175	38,500
Twenty Second st	Combination	Piles	Piles	Fox & Howard	1871	210	28,000
Archer av. at Ogden	Combination	Piles	Piles	Fox & Howard	1871	115	15,000
S. Hubsted st. ship	Wood	Piles	Piles	Fox & Howard			
S. Hubsted st, rebuilt	Iron	Piles	Piles	Kum. Iron Bridge Co	1872	150	15,000
Mulvst	Combination	Piles	Piles	Fox & Howard	1864	152	12,450

## SOUTH FORK OF SOUTH BRANCH

LOCATION	MATERIALS			CONTRACTORS	When Con- struct- ed.	Ln'th	Cost.
	Superstructure	Centr. Pier	Abut- ment's				
*Fuller st. . . . .	Wood	Piles	Piles	N. Chapin & Co. . .	1865	125	7,500
Archer av . . . . .	Combination	Piles	Piles	Fox & Howard	1879	152	13,500
Douglas pl . . . . .	Combination.	Piles	Piles	Fox & Howard	1874		9,800

\*Blown down May 5, 1876.

## WEST FORK OF SOUTH BRANCH

LOCATION.	MATERIALS			CONTRACTORS	When Con- struct- ed.	Let'h	Cost.
	Superstructure	Centr. Pier	Abut- ment's				
Ashland av	Wood	Piles	Piles	Fox & Howard	1871	152	5,000
Western av	Combination	Piles	Piles	F. E. Canda	1869	125	13,000
West'm av over Canal							

## NORTH BRANCH.

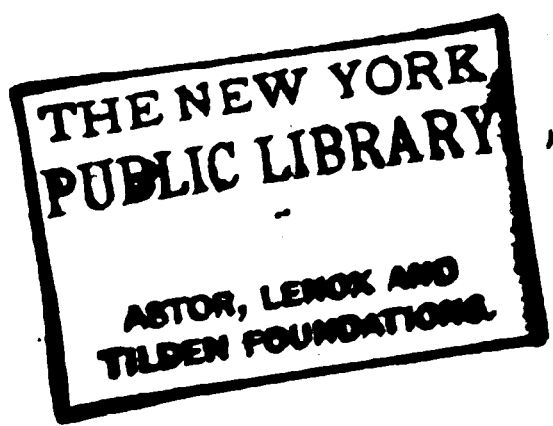
LOCATION	MATERIALS			CONTRACTORS	When Con- struct- ed	Let'h	Cost
	Superstructure	Centr. Pier	Abut- ment's				
Kinzie st . . . . .	Combination	Piles	Piles	Fox & Howard	1870	179	15,850
Indiana st . . . . .	Combination	Stone	Stone	Fox & Howard	1869	163	38,800
Erle st . . . . .	Combination	Piles	Stone	Fox & Howard	1871	290	30,900
Chicago av	Combination	Piles	Piles	Fox & Howard	1867	175	26,700
Chicago av rebuilt	Combination	Stone	Piles	Fox & Howard	1872	175	20,850
N. Halsted st	Wood	Piles	Piles	Fox & Howard	1868	140	7,000
N. Halst. & Ogden can.	Iron	Piles	Piles	Fox & Howard	1874	228	29,945
E. Div'n & Ogden can.	Combination	Piles	Piles	Fox & Howard	1870	180	17,700
W. Div. & N. Branch	Combination	Piles	Piles	Fox & Howard	1869	176	15,794
North av	Wood	Piles	Piles	N. Chapin & Co	1865	145	3,700
Clybourn pl	Combination	Piles	Piles	Fox & Howard	1873	140	23,700
Fullerton av	Piles						

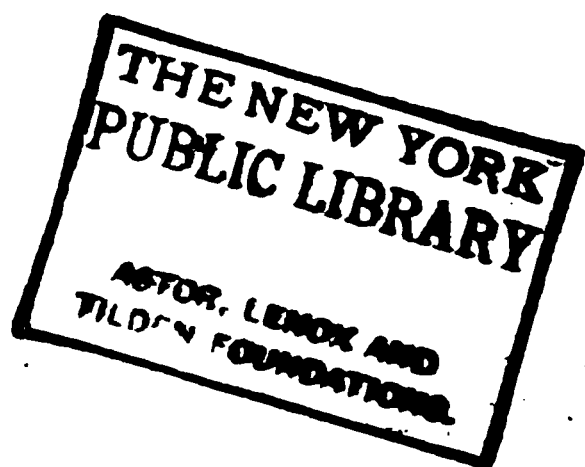
## VIADUCTS.

LOCATION	Mat'ri'l	CONTRACTORS	Length	Cost	When built
Halsted and Sixteenth sts .	Iron	Detroit Bridge Co. . . . .	176 5	24,725.00	1869
VanBuren st . . . . .	Iron	American Bridge Co. . . . .	31	1,275.00	1870
Adams st. . . . .	Iron	Keystone Bridge Co . . . . .	400 16	27,500.00	1869
Madison st . . . . .	Iron	Keystone Bridge Co . . . . .	83	15,675.00	1868
Randolph st . . . . .	Iron	Keystone Bridge Co . . . . .	81	12,260.00	1871
Lake st . . . . .	Iron	Keystone Bridge Co . . . . .	78.25	13,065.00	1872
Wells st . . . . .	Iron	Keystone Bridge Co . . . . .	83	12,900.00	1873
Clark st . . . . .	Iron	Keystone Bridge Co . . . . .	83	12,490.00	1872
State st . . . . .	Iron	Keystone Bridge Co . . . . .	304	29,810.00	1872
Erle st . . . . .	Wood	Fox & Howard	467 11	15,407.00	1871
Indiana st . . . . .	Wood	F. E. Canda	614 7	23,010.00	1869
Canal and Sixteenth sts	Substructure	Fox & Howard		54,687.00	
Approaches and Substructure	Iron	Detmolyer & Hubbard	300	37,200.00	1873
Halsted and Kinzie sts	Iron	Soulerin, James & Co	473	36,080.00	1874
Approaches and Substructure	Iron	W. F. Hubbard		23,792.00	
Twelfth and Beach sts . .	Iron	American Bridge Co	58	4,441.00	1873
Blue Island av. and Throop st	Iron	Keystone Bridge Co		17,131.00	1876
Substructure		Cox Bros		60,758.00	
Milwaukee av. and Kinzie st	Iron	American Bridge Co \$30,320.15 Thos. Leighton, 34,000.00 Jas. Kinzie		70,010.15	1876
Substructure				70,361.40	

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TILDEN FOUNDATIONS.**










Blue Island Avenue Viaduct

## VIADUCTS.

Blue Island avenue viaduct is built at the intersection of Blue Island avenue and Throop street, over tracks of C. & N. W. and C., B. & Q. railways, and forms a  shaped bridge, the long arm being Blue Island avenue and the short arm being Throop street.

The south part of the viaduct is formed with wrought iron truss girders, those over Blue Island avenue being 66 feet long by  $7\frac{1}{2}$  feet high, and forming two roadways, each 23 feet wide in the clear, and two footways 8 feet and 7 feet wide respectively. The north part of the viaduct between the abutment and centre row of columns is supported by 14 wrought iron plate girders, each 46 feet long and 28 inches deep. The roadway is supported on these girders by cross girders of I beams on which are laid wood joists and planking. In this portion of the viaduct both the main girders and auxiliary girders are below the roadway, so as to leave the roadway clear of all obstructions. The sidewalks are protected on the outer edge by a neat railing of gas-pipe.

The substructure was let to Messrs. Cox Bros., of this city, work commencing Oct. 15, 1875, and completed Aug. 25, 1876.

The superstructure was built by the Keystone Bridge Co. of Pittsburg, from plans designed by the Board of Public Works, and which are being carried out by this department. The work is in all respects first class.

Appropriation for substructure.....	\$65,138.13
Appropriation from public benefits....	4,909.06
Appropriation for raising buildings....	10,000.00
Received from C. & N. W. R'y on sub- structure.....	2,373.55
Amount carried forward....	<u>82,420.74</u>

Amount brought forward.....		\$82,420.74
Received from C., B. & Q. R'y on sub- structure.....	2,822.25	
Received from C. & N. W. R'y on sup- erstructure.....	5,768.00	
Received from C., B. & Q. R'y on sup- erstructure.....	11,163.00	\$102,173.99

## COST OF SUBSTRUCTURE.

2,704.77 cords rubble masonry in ap- proach walls, at \$12.....	\$32,457.24	
297.76 cords dimension masonry in abut- ment walls, at \$17.50.....	4,895.80	
12 cords dimension masonry in column piers, at \$25.....	300.00	
51,279 cubic yards filling approaches at 45c.....	23,075.55	\$60,728.59
Inspecting masonry.....		855.00
Raising buildings.....		12,932.00
Sidewalks.....		5,175.14
Built by owners, 1577 ft.....	\$1,577.00	
Built by city, 3,598 ft.....	3,598.14	
Repairing walks.....		43.00
Sewerage Department, materials and labor.....		360.90
Sewerage Department, Cement.....		35.75
Sewerage Department, Brick.....		125.03
Advertising and printing specifications.....		206.00
Castings.....		65.68
Repairing wall.....		25.00
		<hr/>
		\$80,552.59
Cost of superstructure.....		16,931.00
		<hr/>
Total cost.....		\$97,483.59
Balance.....		4,690.40
		<hr/>
		\$102,173.99

## MILWAUKEE AVENUE VIADUCT.

Milwaukee avenue and Desplaines street viaduct is over the tracks of the C. & N. W., M. & St. P., and P. C. & St. L. railways, at their intersection with Milwaukee avenue and Desplaines street.

The north part of the viaduct is built wholly of sheet girders, in five spans, supported on wrought iron columns. The whole of this part of the viaduct is below the roadway, leaving streets free and unobstructed. The width of roadway on Milwaukee avenue is 42 feet, with two sidewalks, each  $8\frac{1}{2}$  feet wide; and on Desplaines street the roadway is 48 feet wide, with two sidewalks, each  $8\frac{1}{2}$  feet wide. There is a substantial iron railing on the outer edge of each sidewalk.

The south part of the viaduct over the M. & St. P. and the P. C. & St. L. railways is built with truss girders. On Milwaukee avenue is one span 94 feet long, one span 71 feet long, and one span  $60\frac{1}{2}$  feet long, supported on wrought iron columns. There are two roadways, each 36 feet wide in the clear, and two sidewalks, each  $8\frac{1}{2}$  feet wide.

On Desplaines street is one truss span 71 feet long, and two sheet girder spans, each 42 feet long, forming two roadways each 21 feet wide in the clear, and two sidewalks each  $8\frac{1}{2}$  feet wide.

The roadways are supported on 12 inch wrought iron beams which extend beyond the trusses to support the sidewalks. Between the beams are  $4\times 12$  pine joists on top of which are  $3\times 6$  string pieces, and 3 inch white oak flooring laid diagonally.

All columns are of wrought iron, anchored to large stone foundations, with the exception of the bridge seats, which are cast iron; all the trusses, girders and columns are of wrought iron.

## STREETS PAVED IN NORTH DIVISION, 1876

NAME OF STREET	CONTRACTOR	When Comm. Work began	When Fin- ished	KIND OF BLOCKS	Length feet in length	Square feet in area
Kinzie from E. L. of N. Wells st. to the North Branch, Larrabee, from N. L. of North ave. to N. L. of Centre st.	Mackin & Watson	May 20 June	June 10 July	6 1/2 inch pine with floor	1,311	7,411
Sedgewick, from N. L. of North ave. to N. L. of Centre st.	B. Harrington	June 20 July	July 10 Aug	8 1/2 inch sand foundation	2,654	11,420
Illinois, from W. L. of Wells st. to F. L. of Market st.	McAdam & Barnett	July 11 Aug	Aug 10 Sept	18 inch blocks sand foundation	723	3,107
Chicago ave. from W. L. of N. Clark st. to the N. Branch	Ray & Willsey	Aug 22 Sept	Sept 10 Oct	18 inch blocks sand foundation	3,891	16,786
Approaches to Chicago ave. on Larrabee st.	Ray & Willsey			18 inch blocks, sand foundation	226	1,257
Dearborn ave. from N. L. of Illinois st. to S. L. of Indiana st.	Mackin & Watson	Oct 11 Oct	Oct 15 Nov	14 inch blocks with floor	210	1,111
Townsend st. from N. L. of Oak st. to N. L. of Elm st.	B. Harrington	Nov 14 Dec	Dec 10 Jan	7 1/2 inch blocks sand foundation	813	3,671
					11,712	49,387

NOTE.—These streets were improved by private contract between property owners and contractors, the city paying for inspections and contracts for engineering and superintending.

## STREETS PAVED IN WEST DIVISION, 1876

NAME OF STREET	CONTRACTOR	When Comm. Work began	When Fin- ished	KIND OF BLOCKS	Length feet in length	Square feet in area
W. Washington st. from E. L. of Leavitt to R. R. tracks	Detweiler & Co	April 24 July	July 10 Aug	16 inch pine, sand foundation	2,643	11,332
Marble place alley, from Desplaines to Halsted st.	Hawley & Barnett	June 10 June	June 15 July	8 1/2 inch pine, sand foundation	806	3,461
Blue Island ave. from S. V. of W. 1st st. to S. 1st st.	J. & H. J. Duffy	July 10 Aug	Aug 10 Sept	12 inch pine sand foundation	1,086	4,648
Fulton, from E. L. Ada to W. L. Sangamon st.	Jas. C. McKean	Aug 28 Aug	Aug 30 Sept	14 inch pine sand foundation	2,020	8,790
W. Lake, from E. L. Western ave. to R. R. tracks	Detweiler & Co	July 24 Aug	Aug 10 Sept	17 1/2 inch oak sand foundation	1,983	8,784
W. Fourteenth st. from W. L. Jefferson to E. L. Blue Isd. av.	J. R. Dyer	Aug 24 Aug	Aug 30 Sept	16 inch pine, sand foundation	4,830	17,702
W. Polk, from W. L. Halsted to E. L. Centre ave.	McAdam & Barnett	Aug 24 Sept	Sept 10 Oct	16 inch pine, intersections & in cedar	2,478	11,274
W. 14th, from W. L. Canalport ave. to W. L. Union st.	J. R. Smith	Oct 4 Oct	Oct 10 Nov	14 inch pine, floor	1,281	5,674
Halsted, 14 feet wide, from Centre, from Harrison to 2nd	J. R. Smith	Oct 10 Oct	Oct 15 Nov	14 inch pine, floor	727	3,436
Fulton, 8 feet wide, from Clinton ave. to 10th st.	W. H. Watson	Nov 17 Nov	Nov 20 Dec	14 inch pine, floor	150	480
Clinton, part of same from S. L. Fulton to N. L. Randolph	W. H. Watson	Nov 20 Dec	Dec 10 Jan	14 inch pine, floor	716	3,094
Approaches to Milwaukee ave. viaduct	Jas. Kincaid	Oct 11 Nov	Nov 10 Dec	20 inch cedar, viaduct filling	1,300	7,000
					28,255	113,327

NOTE.—Streets marked with a star were improved under special assessment, the others by private contract between property owners and contractors the city paying for intersections, and the contractors paying the city for engineering and superintending.

Contract for superstructure.....	\$70,010.15
C. & N. W. R'y    pays.....	\$34,690
P. C. & St. L. R'y    "    .....	17,660
C. M. & St. P. R'y    "    .....	17,660
Obligations for raising buildings, including side-	
walks, have been given for.....	\$72,748.00
Cost to raise balance of buildings.....	15,678.00
Cost to complete sidewalks.....	1,574.00
	<hr/>
	\$90,000.00
The appropriation was .....	40,000.00
	<hr/>
Leaving a deficiency of.....	\$50,000.00

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## STREETS.

The number of miles of improved streets in the city is 124.82 miles, as follows:

Wooden blocks .....	101.79 miles.
Cindered.....	8.45    "
Graveled.....	8.51    "
Macadamized.....	5.54    "
Stone.....	0.53    "
	<hr/>
Total .....	124.82 miles.

The following tables show the details regarding the streets improved during the year:





Name of Street.	From	To	Nature of Improvement	When Im- proved	By Whom Improved	Linear Feet
Central ave	South Water st	East ft. N. Water st	Wooden blocks	1870	Thos. Mackin	458
Chicago ave	Chicago River	N. Clark st	Macadamized	1867	G. W. Truett & Co	3,378
Chicago ave	Chicago River	N. Clark st	Wooden blocks	1867	R. W. Whitney	3,389
Chicago ave	N. Clark st	E. line of Third st	Wooden blocks	1870	DeGolyer & McClelland	1,918
Chicago ave	Madison st	West of Clark st	Wooden blocks	1871	R. W. Whitney	2,010
Clark st	Chicago River	East of Clark st	Wooden blocks	1870	R. W. Whitney	1,395
Clark st	Chicago River	East of Clark st	Wooden blocks	1870	DeGolyer Stuart & Co.	498
Clark st	Madison st	Clark st	Wooden blocks	1869	S. S. Green	308
Clark st	Madison st	Clark st	Wooden blocks	1869	John McBean	3,209
Clark st	Clark st	Clark st	Wooden blocks	1869	John McBean	550
Clark st	Clark st	Clark st	Wooden blocks	1867	Steel & McMahon	1,079
Clark st	Clark st	Clark st	Wooden blocks	1871	J. G. McBean	693
Clark st	Clark st	Clark st	Wooden blocks	1871	J. G. McBean	391
Clark st	Clark st	Clark st	Wooden blocks	1873	DeGolyer & Co	868
Clark st	Clark st	Clark st	Wooden blocks	1873	DeGolyer & Co	1,250
Clark st	Clark st	Clark st	Wooden blocks	1876	P. G. McBean	900
Clark st	Clark st	Clark st	Wooden blocks	1869	P. G. McBean	5,137
Clark st	Clark st	Clark st	Wooden blocks	1869	W. H. Turner	3,684
Clark st	Clark st	Clark st	Wooden blocks	1864	John C. Ure	1,303
Clark st	Clark st	Clark st	Wooden blocks	1867	Steel & McMahon	3,303
Clark st	Clark st	Clark st	Wooden blocks	1868	DeGolyer & McClelland	2,556
Clark st	Clark st	Clark st	Wooden blocks	1869	DeGolyer & McClelland	2,581
Clark st	Clark st	Clark st	Wooden blocks	1874	Thos. Mackin	2,640
Clark st	Clark st	Clark st	Wooden blocks	1872	Rolt Stuart	363
Clark st	Clark st	Clark st	Wooden blocks	1867	Rolt Stuart	1,167
Clark st	Clark st	Clark st	Wooden blocks	1869	McBean & Bero	1,633
Clark st	Clark st	Clark st	Wooden blocks	1869	Hervay Nash	1,588
Clark st	Clark st	Clark st	Wooden blocks	1870	W. H. Watson	710
Clark st	Clark st	Clark st	Wooden blocks	1872	R. W. Whitney	796
Clark st	Clark st	Clark st	Wooden blocks	1870	John Anderson & Co.	3,650
Clark st	Clark st	Clark st	Wooden blocks	1870	W. H. Watson	3,182
Clark st	Clark st	Clark st	Wooden blocks	1870	G. M. French	3, 14
Clark st	Clark st	Clark st	Wooden blocks	1870	B. Bartine	2,039
Clark st	Clark st	Clark st	Wooden blocks	1865	Robert Stuart	272
Clark st	Clark st	Clark st	Wooden blocks	1874	DeGolyer & Roswell	6,225
Clark st	Clark st	Clark st	Wooden blocks	1875	J. B. Smith	330
Clark st	Clark st	Clark st	Wooden blocks	1870	J. B. Smith	243
Clark st	Clark st	Clark st	Wooden blocks	1874	B. Hartington	416
Clark st	Clark st	Clark st	Wooden blocks	1874	Thos. Reilly & Co	2,421
Clark st	Clark st	Clark st	Wooden blocks	1875	DeGolyer & McClelland	378
Clark st	Clark st	Clark st	Wooden blocks	1871	DeGolyer & McClelland	378



## ALPHABETICAL LIST OF IMPROVED STREETS, ETC.—CONTINUED.

Name of Street.	From.	To.	Nature of Improvement.	When Improved.	By Whom Improved.	Lineal Feet.
Dearborn st	Madison st	Monroe st	Wooden blocks	1865	Thos. Mackin	307
Dearborn st	Monroe st	Jackson st	Wooden blocks	1870	Thos. Mackin	793
Dearborn st	S. Water st	Lake st	Wooden blocks	1873	DeGolyer & Co.	1,529
Dearborn st	Lake st	Randolph st	Grade raised, old blks. reused.			
Dearborn st	Randolph st	Madison st	Wooden blocks	1871	DeGolyer & Co.	379
Dearborn st	Twenty-seventh st	Thirtieth st	Wooden blocks	1873	DeGolyer & Co.	744
Dearborn st	Thirtieth st	Thirty-second st	Wooden blocks	1874	Robert Stuart	1,707
Dearborn st	Thirty-second st	Thirty-third st	Wooden blocks	1874	J. B. Smith	1,180
Dearborn ave	N. Water st	Chicago av.	Wooden blocks	1874	W. F. Hildreth	804
Dearborn ave	Chicago ave	Division st	Wooden blocks	1869	Thos. Mackin	2,497
Dearborn ave	Division st	North av	Wooden blocks	1869	McBean & Bro	2,556
Dearborn ave	Indiana st	North av	Wooden blocks	1869	Robt. McClelland	2,647
Dearborn ave	Indiana st	Illinois st	Wooden blocks	1875	DeGolyer & Co.	8,124
Dearborn pl	Randolph st	Washington st	Wooden blocks	1876	Mackin & Watson	219
DePuyser st	Desplaines st	Halsted st	Wooden blocks	1869	John Anderson & Co.	385
Desplaines st	VanBuren st	Fourth st	Wooden blocks	1871	Kinrade & Donoghue	806
Desplaines st	VanBuren st	Harrison st	Wooden blocks	1869	John Anderson & Co.	4,825
Division st	Clark st	Clybourn ave	Wooden blocks	1870	J. G. McBean	795
Division st	Clybourn ave	Halsted st	Wooden blocks	1869	DeGolyer & McClelland	2,071
Division st	N. Branch Canal	N. Branch Chicago River	Wooden blocks	1871	Steele, McMahon & Steele	2,290
Douglas ave	S. Park ave	I. C. R. R.	Cinderling	1871	A. Walbaum & Co.	1,862
Elston ave	W. Clybourn pl.	W. Fullerton ave	Wooden blocks	1871	Robt. Stuart	2,520
Fifteenth st	Wabash ave	S. Branch River	Wooden blocks	1871	McHugh & Duffy	4,320
Fifteenth st	Canalport ave	Union st	Wooden blocks	1869	Thos. Mackin	2,308
Erie st	N. Branch River	Pine st	Wooden blocks	1876	J. B. Smith	1,331
Eagle st	Desplaines st	alsted st	Wooden blocks	1870	DeGolyer & McClelland	4,755
Fourteenth st	Michigan ave	State st	Wooden blocks	1875	W. F. Hildreth	739
Fourteenth st	State st	Clark st	6 in. round cedar, vulcanite filling.	1870	DeGolyer & McClelland	720
Fourteenth st	Blue Island av.	Jefferson st	Hemlock blocks	1875	Ray & Whitney	754
Franklin st	S. Water st	Lake st	Wooden blocks	1876	L. R. Dyer	3,830
Franklin st	Lake st	Randolph st	Block stones	1868	Steele & Mackin	316
Franklin st	Randolph st	Madison st	Wooden blocks	1857	John McBean	380
Franklin st	Adams st	Monroe st	Wooden blocks	1868	Steel & McMahon	762
Fifth ave	VanBuren st	Tyler st	Cedar blocks	1875	J. G. McBean	397
Fifth ave	Lake st	S. Water st	Macadamized	1835	John D. Mahoney	306
Fifth ave	Randolph st	Lake st	Wooden blocks	1857	S. S. Greely, for Nicholson	320
Fifth ave	Randolph st	Madison st	Boulder stones	1857	Property Owners	396
Fifth ave	VanBuren st	Madison st	Canal stone	1859	James McKenny	396
Fifth ave	VanBuren st	Madison st	Wooden blocks	1865	Stuart & Steele	1,588

ALPHABETICAL LIST OF IMPROVED STREETS, ETC.—CONTINUED.

[illegible]







## ALPHABETICAL LIST OF IMPROVED STREETS, ETC., -CONTINUED-

[illegible]





## ALPHABETICAL LIST OF IMPROVED STREETS, ETC. CONTINUED

[illegible]







A perusal of the foregoing table shows the average or ordinary life of wooden block pavement to be about 7 years. Pavement of round cedar blocks laid in same manner as sawed pine blocks, has been laid to a considerable extent in the past year, and meets with general favor, the supposition being, that cedar being less liable to decay than pine, the pavement will have longer life.

Pavement of Medina stone has been laid for a distance of 795 feet on Pacific avenue, by the Michigan Southern and Lake Shore Railway. Its qualities are well known at the east.

The amount of wooden block pavement in the city has increased from  $1\frac{1}{8}$  miles in 1863 to  $101\frac{7}{8}$  miles in 1876, an average of about 8 miles per year. The amount laid last season, eleven miles, principally by private contract, indicates the favor with which property owners still regard it.

I am of the opinion that for streets occupied by wholesale firms and manufacturers, where the traffic is principally by heavily laden teams, pavement of block stone of uniform thickness, properly laid, will eventually meet with the favor of property owners. The objections to stone pavement is the original cost being greater than wooden blocks, and the noise made by trucks and wagons, and wear and tear on horses and vehicles. This is offset by the fact that the lasting qualities of the pavement is three or four times that of wooden blocks. For instance, LaSalle street, from Randolph street to Washington street, was paved with stone blocks from the canal quarries in 1858, nineteen years ago, and is still in condition with ordinary repairs, to last several years.

Owing to the small appropriation for the past year, it has been imposible to keep the streets in as cleanly condition as during previous years. The improved streets were partially cleaned by laborers and teams, in the employ of the city, from the sus-

pension of the contract in December last to August of this year. A contract was then awarded to sweep and clean by machinery for \$24.90 cents per mile, for each mile swept and cleaned, each time of cleaning, all paved streets to be cleaned once each month instead of twice and four times each month as during previous years. The amount cleaned was as follows:

North Division,	64.05 miles, at \$24.90.....	\$1,594.85
South Division,	113.22 miles, at 24.90.....	2,819.18
West Division,	118.57 miles, at 24.90.....	2,952.39
<hr/>		
Total No. miles,	295.84	Total cost, \$7,366.42

The total cost of cleaning and repairing street was as follows:

STREET CLEANING AND REPAIRS.

DIVISION.	Cleaning Improved Streets.	Cleaning and Repairing Streets.	Lumber.	Tools, Nails, Spikes and Hardware.	Gravel, Macadam and Cinders.	Repairing Tools.	Rent of Lot for Lumber Yard.	Miscellaneous.
North.....	\$1,594.85	\$22,970.93	\$780.97	201.20	\$187.50	\$115.60	\$120.66	\$15.00
South.....	2,819.18	35,545.43	620.51	356.99	1,827.05	437.75	.. .. .	84.00
West.....	2,952.39	51,022.39	1,740.65	508.84	778.90	456.41	195.00	198.41
Total....	\$7,366.42	\$109,538.75	\$3,142.13	\$1067.03	\$2,793.45	\$1,009.76	\$315.66	\$297.41

The following table shows the character of the carpenter work done under the head of repairs.

	NORTH DIVISION				SOUTH DIVISION				WEST DIVISION			
	No Yds.		LUMBER		No Yds.		LUMBER		No Yds.		LUMBER	
			PINE	OAK			PINE	OAK			PINE	OAK
Aprons.	55				157				251			
Street crossings	40				198				129			
Alley crossings	25				46				150			
Alley bridges	10				15				8			
Alley culverts	8				12				41			
Street culverts	6				21				63			
Paving, general rep's		3,110				3,800				4,120		
Paving for Gas Co		300				250				980		
Paving, st permits		600				1,200				1,500		
Paving for sew'r de't		24				50				63		
Paving for water de't		500				500				209		
Paving bridge apr's		407										
Planking aprons to bridges												
Planking aprons and viaducts												
Planking streets												
Sidewalk steps	30											
Drain boxes	30											
Sidewalks.												
Railings												
Inter's'n of sidewalks												
General repairs.												
Lumber for paving						550						
Stone paving, gutters							37,938				107,745	40,178
		4,941	58,240			6,346	37,938			6,872	107,745	40,178

In addition to the showing of this table, a large amount of work was done by the street carpenters, building sidewalks at Blue Island avenue and Milwaukee avenue viaducts, necessitated by the raising of the buildings.

The unimproved streets and alleys have been graded and kept in as good condition as circumstances would permit, the gutters cleaned and sunken places filled. The streets improved with cinders and gravel have not received much attention, owing to want of material. Many of the crossings and culverts of unimproved streets, are in great need of renewing and repairs, and it will not be a matter of economy to neglect them another year. The repair of pavement on blocked streets during the year has not been as thorough as was desirable, and for the coming year will need a large amount of materials and labor. This is not only a necessity, but a matter of economy.

## SUPPLIES.

The number of kegs of nails and spikes used was 513, as follows:

North division.....	52 kegs.
South division.....	59 “
West division.....	149 “
City Hall.....	3 “
Bridges.....	109 “
Halsted street viaduct.....	37 “
Blue Island avenue viaduct.....	35 “
Milwaukee avenue viaduct.....	18 “
Sidewalks, West Division.....	10 “
Sidewalks, North Division.....	5 “
Indiana street viaduct.....	36 “

The bridge department used 350 gallons carbon oil, 198 gallons lard oil, 113 tons coal.

The street department used 84 cubic yards gravel, 3384 cubic yards macadam, 1634 cubic yards cinders. The amount of lumber used for repairs during the year was 1,046,808 feet, distribution and cost as follows:

	PINE	OAK.	TIMBER.	COST.
North Division.....	\$58,240			\$61119
South Division.....	37,938			498.72
West Division.....	107,745			927.88
West Division.....		40,178		1,029.69
Bridge Department.....	63,818			889.42
Bridge Department.....		238,414		4,670.62
Bridge Department.....			17,489	606.07
City Hall.....	8,731			293.00
Sidewalks, West Division.....	39,408			452.59
Indiana street viaduct.....	9,960			138.07
Indiana street viaduct.....		57,949		1,011.87
Canal st. viaduct sidewalks.....	84,914			883.25
Blue Island ave. viaduct sidewalks.....	225,608			2,601.49
Halsted and 16th st. viaduct sidewalks..	22,686			271.56
Halsted and 16th st. viaduct sidewalks..		26,425		532.46
Washington st. Tunnel.....	7,305			73.05
Total.....	666,353	362,966	17,489	\$15491.33

FIRST ANNUAL REPORT OF  
STREET LAMPS.

From the first of January to the first of March, the repairing of broken street lamps was done under contract. From that date to the first of September no repairing was done. About the first of October there were between three and four thousand broken lamps reported.

I herewith present the report of Mr. John Stewart, who superintends the repairing, etc.

CHICAGO, January 1st, 1877.

GEO. W. WILSON, ESQ., *Superintendent*,

DEAR SIR:—I herewith submit my report for the nine months ending this date, for street lamps, repairs and gas burners, with the average cost.

The first three months of the fiscal year was under contract. For the six months following, nothing of consequence was done in repairing lamps, which accounts for the large amount expended during the last three months.

Total number of street lamps repaired and glazed from April 1st to October 1st, 1876, 6 months, 208; cost \$119.15

123 new lamps cost \$492.00

Total number of lamps glazed from October 1st to December 31st, 1876, 4,289.

Total cost of repairing and painting 510 lamps \$439.42

Total cost of glass for 4,289 lamps—

4,736 side lights.....	401.40
2,356 door lights.....	195.30
4,500 top lights.....	197.50
<hr/>	<hr/>
11,592	\$794.20

Total cost of labor putting in glass, \$809.92

Total cost of glass, repairing, painting and glazing, 4,289 lamps, \$2,043.54

50 new street lamps cost..... 187.50

8 new viaduct lamps cost..... 24.00

\$211.50

Total amount expended for lamps and repairs, nine months, \$2,866.19; average cost repairing 4,289 lamps with glass, 37½ cents.

Average cost repairing 510 lamps with tin and painting, 86 cents.

Average cost repairing 4,289 lamps with tin, glass and painting, 47½ cents.

Total number of three feet burners put on to replace five feet, 10,553.

Total cost of new three feet burners, \$933.86

Total cost of taking off old, and putting on new burners, \$316.59

Average cost per burner on lamp, 11¼ cents.

Respectfully submitted,

JOHN STEWART.

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## HARBOR.

Very little dredging was done during the past year, partly from the channel having been well cleaned the year before, but more especially on account of the high water in the river during the season of navigation, averaging about 11<sup>72</sup>/<sub>100</sub> feet above city base, giving a depth of water of about fourteen feet in the whole channel.

Respectfully submitted,

GEO. W. WILSON,

*Supt. Streets and Bridges.*



## SPECIAL ASSESSMENT DEPT

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CHICAGO, January 1, 1877.

HON. M. HEATH, *Mayor*,

*In Charge Department Public Works,*

DEAR SIR:—I submit, herewith, a tabular statement of Special Assessments made in this department for the year ending December 31, 1876; also a summary of the cost of the various improvements in the three divisions of the city, the number of miles of street improvements, the number of lamp posts, and the amount of special assessments made in each year for the past sixteen years.

I also submit a report of new sidewalks built during the past year.

The system of paving streets by private contract, which has been largely carried on since the great fire, will, from all appearances, be abandoned in a great measure, and the old system of letting contracts to the lowest responsible bidder be reinstated. The reasons being that property owners are beginning to discover that this is much the cheaper and [better plan, and the contractors finding it so difficult to collect their bills where there is no lien on the property.

It has been found an utter impossibility to get all the property owners to join in any private contract, and the contractor, to save himself from loss, is obliged to increase his price to those who are willing to pay, in proportion to the number refusing to en-

ter into his private contract, thus virtually making those who sign not only pay for improving their own property, but a *pro rata* of what is not included in the private contract.

The principal reason given for not having work done under special assessment (and one which the private contractors have used with effect), is, that after paying an assessment, the property owners have to wait a long time before receiving the excess of the assessment over the actual cost of the work.

Under the old system (where no excess was paid until the whole assessment was collected), this was a very forcible argument; but since 1870 all amounts due for the excess have been ready to be refunded within thirty days from the completion of the work. So this argument is purely imaginary.

It is a self-evident proposition, that a contractor, when bidding against a number of persons in the same business, would make his figures lower than when he has no competition, but fixes the price himself, and a reference to the contracts made by the city under special assessment and private contracts made during the past five years, will show a difference in cost in favor of the former, varying from fifty cents to one dollar and seventy cents per front foot.

All the decisions of the Supreme Court since the adoption of Article 9, have been favorable to the city, and hereafter the ultimate collection of all assessments made in accordance with this law, is an assured fact.

## STATEMENT OF ASSESSMENTS FOR WOODEN BLOCK PAVEMENT.

No. of War. rail.	Name of Street.	From	To.	Amount of Assessment.
2884	Taylor st. . .	Clark st. . . . .	State st. . . . .	\$ 4,382 33
2885	Centre st. . .	N Franklin st. . . . .	Lincoln ave. . . . .	3,427 87
2886	W. Lata st. . .	Albion st. . . . .	Centre ave. . . . .	2,958 91
2887	Rucker st. . .	W Chicago ave. . . . .	Milwaukee ave. . . . .	3,920 80
2914	W. Thirteenth st.	Carrollport ave. . . . .	Halsted st. . . . .	19,244 42
2915	Cottage Grove ave.	In front of s. blots 10 & 11, c	part Ellis add. . . . .	468 85
2916	Haddock pl. . .	Fifth ave. . . . .	LaSalle st. . . . .	803 06
2917	N. Dearborn st. .	Illinois st. . . . .	Indiana st. . . . .	1,986 39
2929	W. Lash ave. . .	Sundry lots Congress st. . .	Thirteenth st. . . . .	2,461 03
2922	Bryant ave. . .	In front of s. blots 5&7, of its	4,7 & s. blk 4, w pt Ellis' add	962 66
2923	N. Wells st. . .	Sundry lots Chicago ave. . .	Division st. . . . .	1,915 14
2938	Division st. . .	N. Clark st. . . . .	Stone st. . . . .	10,746 01
2946	N. State st. . .	Kinzie st. . . . .	Chicago ave. . . . .	14,824 80
2942	W. Lake st. . .	Western ave. . . . .	25th & w l of c. s. e. 1/4 S 12	16,494 10
2943	Husband st. . .	Sundry lots Ashland ave. . .	Hoyne ave. . . . .	2,667 54
2944	W. Lash ave. . .	Sundry lots Thirteenth st. .	Twenty-second st. . . . .	4,812 16
2948	Chicago ave. . .	Sundry lots N. Clark st. . .	N. branch Chicago River	3,751 58
2968	Ally. . . . .	In front of sublot 8, of lot 1	blk. 81, School sec add. . .	199 02
2970	Indiana ave. . .	Sundry lots Twenty sec'd st	Twenty-ninth st. . . . .	3,159 60
2974	School st. . . .	Displacement st. . . . .	E. 1 of blk 1, School sec	1,499 98
2977	Jackson st. . .	Clark st. . . . .	Fifth ave. . . . .	4,614 42
2984	Arthur ave. . .	(Sundry lots) Halsted st. . . .	S. b. of S. b. of Chicago R	16,993 00
2985	Sedgwick st. . .	Sundry lots North ave. . . .	Lamont ave. . . . .	1,056 39
2986	W. Polk st. . .	Sundry lots Halsted st. . . .	Centre ave. . . . .	1,107 76
2987	State st. . . .	Sundry lots Jackson st. . . .	Harrison st. . . . .	4,623 11
2996	State ninth st. .	Michigan ave. . . . .	E. 1 of Prairie ave. . . .	7,454 76
2997	Hoyne st. . . .	W. Madison st. . . . .	W. Harrison st. . . . .	16,889 46
2998	Fulton st. . . .	(Sundry lots) Sangamon st. .	Elizabeth st. . . . .	7,001 61
				\$157,558 22

## STATEMENT OF ASSESSMENTS FOR MISCELLANEOUS STREET AND ALLEY IMPROVEMENTS.

No. of War. rail.	Nature of Improvement.	Name of Street	From	To.	Amount of Assessment.
2910	Grading and cinder'g	Ally bet 13th pl and W 13th st	Throop. . . . .	Loomis st. . . . .	\$ 873 50
2917	Grading and cinder'g	Ally in b. e. 1/4 of blk 53, n. w. 1/4 sec	21, 8, 14	.. . . .	306 05
2921	Curb'g and filing	N. Halsted st. . . . .	Division st. . . . .	Fullerton ave. . . . .	38,567 62
2941	Grading and macad'g	W. Madison st. . . . .	C. C. & 1 C. R. Rd	Crawford ave. . . . .	27,810 03
2977	Curb'g and filing	N. Halsted st. . . . .	N. b. Chicago R	Division st. . . . .	6,424 16
					\$73,980 30

## STATEMENT OF ASSESSMENTS FOR STREET OPENINGS AND WIDENINGS.

No. of War. rail.	Nature of Improvement.	Name of Street	From	To.	Amount of Assessment.
2958	Opening or extension	Dearborn st. . . . .	Jackson st. . . . .	Fourteenth st. . . . .	\$1,077 536 92
2957	Opening and widening	Calumet ave. . . . .	Thirty-third st. . . . .	Douglas ave. . . . .	15,276 30
2968	Opening. . . . .	Lafield ave. . . . .	through to	W. Lake st. . . . .	4,134 15
2960	Widening. . . . .	Ashland ave. . . . .	W. Division st. . . . .	Milwaukee ave. . . . .	6,584 00
2991	Opening and widening	W. Washington st. . . . .	12, Wab'nian s. sd	Homan ave. . . . .	89,049 83
2993	Opening or extension	Vernon ave. . . . .	Thirty-seventh st. . . . .	Egan ave. . . . .	18,156 00
2994	Opening. . . . .	Belden ave. . . . .	Richie ave. . . . .	Fullas st. . . . .	8,369 68
2965	Opening or extension.	Quinn st. . . . .	Stearns st. . . . .	N. 1/4 its 8&9, blk. 24, sec 29	6,605 02
2999	Widening. . . . .	W. Eighth st. . . . .	Halsted st. . . . .	W. l. bk 2, Asrs. dv. n 1/4 & e 1/4 sec 20	32,630 43
					\$1,290,023 83

STATEMENT OF ASSESSMENTS FOR ALLEY OPENINGS AND  
WIDENINGS.

No. of Warrant.	Nature of Improvement.	Amount of Assessment.
2888	Opening	Alley block 3, Brand's addition
2892	Extension and widening	Alley bet 3rd ave & State st from 12th st to 14th st
		\$2,806 28
		3,132 44
		\$5,938 64

STATEMENT OF ASSESSMENTS FOR THE ERECTION OF LAMP  
POSTS.

No. of Warrant.	No of Posts.	Name of Street.	From.	To.	Amount of Assess'm't
2888	7	Irving pl	W. Polk st.	its southern terminus	\$212 45
2889	11	Henry st	Blue Island ave	Laurens st	331 85
2890	4	Rucker st	W. Chicago ave	Madwaukee ave	123 90
2891	8	Tompkins st.	W. Polk st	W. Taylor st	242 80
2892	6	W. Ohio st	Saugamon st.	Carlin st	150 10
2893	8	Marshfield st	W. Taylor st	W. Twelfth st	242 80
2894	8	Paula st	W. Polk st	W. Taylor st	242 80
2895	21	W. Taylor st	Throop st	Marshfield st	728 40
2894	4	South side of Wood	dland Park		121 90
2921	3	W. Harrison st	Ashland ave	250 feet east	96 05
2925	7	Bremer st	Hobbs st.	Division st	212 45
2927	4	Ontario st	N. Dearborn st	Pine st	173 90
2928	11	Tremont st	Centre st	Webster ave	333 85
2929	4	W. Taylor st	Marshfield st	Paulina st	123 90
2930	3	Thirty-first st	Groveland Park ave.	Lake Park ave	96 05
2931	5	Groveland Pk ave	Thirtieth st	Thirty-first st	151 75
2932	6	Lake Park ave	Thirtieth st	Thirty-first st	182 10
2933	14	N. Halsted st	Willow st	Centre st	424 90
2934	12	Paulina st.	Homan st	W. Eighteenth st	328 29
2935	27	W. Nineteenth st	Ashland ave	Robey st	819 45
2936	3	Johnson pl.	its northern terminus	Thirty-eighth st	96 05
2937	1	Twenty-seventh st	S. Park ave	Cottage Grove ave	35 35
2938	6	Johnson pl.	Thirty-eighth st	Egan ave	182 10
2939	2	Egan ave	Johnson pl	Langley st	65 70
2940	3	Thirty-fourth st	Vernon ave	Rhodes ave	96 05
2942	32	W. Twenty-first st	Ashland ave.	Hoyle ave	961 20
2946	3	Schiller st	N. Clark st	N. Dearborn st	96 05
2947	10	As. Land ave	Blue Island ave	800 feet south	263 50
2946	5	McGrath st	Hoyle ave	its western terminus	155 00
2948	13	Warren ave.	Western ave	Pollock st	403 00
2949	4	Peoria st	W. Kinzie st	W. Indiana st	126 50
2980	4	Thirtieth pl.	Blue Island ave	Waller st	126 50
2981	8	Lafayette st.	W. Polk st	W. Taylor st	248 00
2982	50	Archer ave	Halsted st	S. b. of S. b. Chicago R.	1,620 85
2983	4	Honore st	W. Congress st	W. Harrison st	126 50
					\$9,983 75

## STATEMENT OF ASSESSMENTS FOR LAYING PRIVATE DRAINS.

No. of Warrant.	Name of Street	From.	To.	Amount of Assess'm't
2972	Bryant ave	Vincennes ave	Stanton ave	\$326 25

STATEMENT OF ASSESSMENTS FOR LAYING WATER SERVICE  
PIPES.

No. of Ward- rant.	Name of Street.	From.	To.	Amount of Asses'm't
2839	Archer ave .....	Halsted st .....	S. b. of S. b. Chicago R	\$4,172 25
2873	Bryant ave... ..	Vincennes ave... ..	Stanton ave. ....	244 75
				\$4,417 00

STATEMENT OF ASSESSMENTS FOR THE CONSTRUCTION OF  
SIDEWALKS.

No. of Ward- rant.	Name of Street.	From.	To.	Amount of Asses'm't
2886	Loomis st .....	W. Polk st .....	W. Harrison st....	\$ 56 04
2887	Oakley ave .....	Moore st .....	Blue Island ave ..	377 17
2888	Lafayette st .....	Thirty-first st .....	Douglas ave .....	57 74
2889	Vernon ave .....	Thirty-third st .....	Douglas ave .....	36 00
2900	Noble st .....	Bradley st .....	North ave .....	58 00
2901	N. Franklin st .....	N. Clark st .....	Webster ave .....	126 38
2902	Calumet ave .....	Douglas ave. ....	S. 1 of lot 2 blk. 2, Dyer & Davison's	89 02
2903	Ashland ave .....	W. Thirty-third st ..	Egan ave .....	300 75
2904	Genesee ave .....	W. Twenty-second st ..	W. Twenty-fifth st ..	35 80
2905	Dale pl .....	W. Twenty-second st ..	its southern terminus...	95 32
2906	W. Harrison st .....	Desplaines st .....	Centre ave. ....	166 83
2907	Corwin p. ....	Moore st .....	its southern terminus ..	60 05
2908	York st .....	Ashland ave .....	Hermitage ave .....	72 50
2909	W. Polk st .....	Halsted st .....	Centre ave .....	162 66
2910	Edgar st .....	Wabasha ave... ..	Loomingdale rd .....	128 76
2911	Wallace st .....	Douglas ave .....	Egan ave .....	129 11
2912	Felen st .....	M. Iwankee ave .....	N. Wood st .....	51 12
2913	Twenty-second st ..	State st .....	Clark st .....	170 55
2944	Ashland ave .....	W. Madison st .....	W. Indiana st....	65 28
2945	Moore st .....	Wood st .....	Robey st .....	395 47
2946	Douglas ave .....	S. Park ave .....	Indiana ave. ....	128 00
2947	Conover st .....	Blackhawk st .....	Blanche st .....	68 52
2948	Leavitt st .....	LeMoine st. ....	North ave .....	35 04
2949	Warren ave....	Ashland ave. ....	Ogden ave .....	54 80
2950	Ogden ave .....	Warren ave .....	W. Madison st. ....	62 40
2951	Samuel st .....	W. Chicago ave .....	W. Division st .....	304 40
2952	Robey st .....	W. Madison st .....	W. Chicago ave .....	268 92
2953	N. Wells st .....	Chicago ave .....	Division st .....	465 47
2954	W. Taylor st .....	Centre ave .....	Fyffe st .....	72 00
2955	W. Twenty-fourth st	Millard ave .....	Central Park ave ..	43 43
2957	Ogden ave .....	California ave .....	Douglas Park ave ..	536 40
2965	Springer ave .....	Chilman st .....	Waterville st. ....	50 66
				\$4,873 08

## SUMMARY.

Total assessments for wooden block  
pavement, including curbing and fill-  
ing:

North Division. .... \$38,208.24

South Division..... 50,395.40

West Division..... 68,934.58

\$157,538.22

Total assessments for miscellaneous  
street and alley improvements:

North Division.....	44,991.72	
West Division.....	28,988.58	
	<hr/>	73,980.30

Total assessments for street openings  
and widenings:

North Division.....	8,360.68	
South Division.....	1,117,664.74	
West Division.....	132,998.41	
	<hr/>	1,259,023.83

Total assessments for alley openings  
and widenings:

South Division.....	3,132.44	
West Division.....	2,806.20	
	<hr/>	5,938.64

Total assessments for erection of lamp  
posts:

North Division.....	1,241.15	
South Division.....	2,647.70	
West Division.....	6,094.90	
	<hr/>	9,983.75

Total assessments for laying private  
drains:

South Division.....		326.25
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Total assessments for laying water  
service pipes:

South Division.....		4,417.00
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Total assessments for constructing  
sidewalks:

North Division.....	661.83	
South Division.....	962.34	
West Division.....	3,248.91	
	<hr/>	4,873.08

Total amount of assessments for  
North, South and West Divisions..

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1,516,081.07

## NORTH DIVISION.

Total amount of assessments for street improvements . . . . .	93,462.62	
Total amount payable out of appropriation fund on account of same..	19,319.82	
	<hr/>	
Total estimated cost of street improvements in North Division . . . . .		112,783.44

## SOUTH DIVISION.

Total amount of assessments for street improvements . . . . .	1,179,545.87	
Total amount payable out of appropriation fund on account of same..	51,686.79	
	<hr/>	
Total estimated cost of street improvements in South Division . . . . .		1,231,232.66

## WEST DIVISION.

Total amount of assessments for street improvements . . . . .	243,071.58	
Total amount payable out of appropriation fund on account of same..	21,947.62	
	<hr/>	
Total estimated cost of street improvements in West Division . . . . .		265,019.20

Total estimated cost of street improvements in North, South and West Divisions . . . . .		\$1,609,035.30
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To be paid from appropriation fund for street improvements in the—

North Division . . . . .	19,319.82	
South Division . . . . .	51,686.79	
West Division . . . . .	21,947.62	
	<hr/>	
		92,954.23

Total number of lamp posts provided for by assessments:

NORTH DIVISION.

From January 1, 1876, to January 1,		
1877 .....	39	
Posts erected prior to January, 1, 1876	2,085	
		2,124

SOUTH DIVISION.

From January 1, 1876, to January 1,		
1877 .....	92	
Posts erected prior to January 1, 1876	2,954	
		3,046

WEST DIVISION.

From January 1, 1876, to January 1,		
1877 .....	202	
Posts erected prior to January 1, 1876	5,089	
		5,291

Total number of posts in the city provided for by special assessment....		10,461
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In addition to the above there are bridge and viaduct lamp posts not provided for by special assessment, which makes the total number of lamp posts in the city.....10,553

The following improvements have been made during the past year:

PAVED WITH WOODEN BLOCKS—NORTH DIVISION.

Name of Street.	From.	To.	No. of lineal ft.
Larrabee st.....	North ave .....	N. line Centre st.....	2,554
Sedgwick st.....	North ave.....	S. line Centre st.....	2,555
Chicago ave.....	N. Clark st.....	N. br. Chicago River.....	3,309
Townsend st.....	Oak st .....	N. line Elm st.....	813
		Total .....	9,231



PAVED WITH WOODEN BLOCKS—SOUTH DIVISION.

Name of Street.	From.	To.	No. of lineal ft.
Franklin st.....	Adams st....	Monroe st.....	397
Indiana ave.....	Twenty-second st.....	Twenty-ninth st.....	2,788.50
Calumet ave.....	Twenty-ninth st.....	Thirty-first st.....	1,202.68
Archer ave.....	Halsted st.....	S. b. of S. b. Chicago River	5,003.08
Twenty-second st.....	State st.....	W. line of S. LaSalle st...	961.25
State st .....	Jackson st.....	100 ft. N. of Harmon ct .	3,109.50
		Total .....	14,142.01

PAVED WITH MEDINA BLOCK STONE PAVEMENT.

Name of Street.	From.	To.	No. of lineal ft.
Pacific ave.....	Harrison st.....	Polk st. ...	795

PAVED WITH WOODEN BLOCKS—WEST DIVISION.

Name of Street.	From.	To.	No. of lineal ft.
W. Washington st.....	E. curb line Leavitt st.....	P. C. & St. L. R. R.....	2,045
Blue Island ave. ....	W. Fifteenth st.....	S. l. of W. Twenty-first st	3,006
Fulton st.....	Sangamor st .....	Ada st.....	2,001
W. Lake st.....	E. curb line Western ave.	P. C. & St. L. R. R .....	1,353
W. Fourteenth st .....	Jefferson st.....	Blue Island ave.....	3,830
W. Polk st. ....	Halsted st .....	entre ave.....	2,478
W. Eighteenth st.....	Canalport ave.....	W. line Union st.....	1,331
Fulton st.....	Clinton st ...	150 ft. west.....	150
Approaches to Milwaukee	ave. viaduct .....	.....	500
		Total .....	18,004

SUMMARY.

This, in addition to improvements previously reported, gives the following

RECAPITULATION.

537,454	lineal ft. of wooden block pavement, equal to	101 <sup>474</sup> / <sub>520</sub> miles.
44,585	“ of cindering, equal to.....	8 <sup>345</sup> / <sub>520</sub> “
44,953	“ of graveling, equal to.....	8 <sup>713</sup> / <sub>520</sub> “
29,243	“ of macadamizing, equal to.....	5 <sup>843</sup> / <sub>520</sub> “
2,817	“ of stone pavement, equal to.....	2 <sup>817</sup> / <sub>520</sub> “

Total number of miles improved in the city... 124<sup>432</sup>/<sub>520</sub> miles.

These improvements are distributed in the three divisions of the city as follows:

## NORTH DIVISION.

119,013	lineal ft. of wooden block pavement, equal to	22 <sup>2853</sup> <sub>5280</sub>	miles.
5,044	“ of cindering, equal to.....	5044 <sub>5280</sub>	“
2,217	“ of graveling, equal to.....	2217 <sub>5280</sub>	“
3,049	“ of macadmizing, equal to.....	3049 <sub>5280</sub>	“
908	“ of stone pavement, equal to.....	908 <sub>5280</sub>	“

Total number of miles improved in the North Div'n 24<sup>3511</sup><sub>5280</sub> miles.

## SOUTH DIVISION.

179,247	lineal ft. of wooden block pavement, equal to	33 <sup>5007</sup> <sub>5280</sub>	miles.
28,816	“ of graveling, equal to.....	5 <sup>2416</sup> <sub>5280</sub>	“
10,291	“ of macadamizing, equal to.....	1 <sup>511</sup> <sub>5280</sub>	“
1,909	“ of stone pavement, equal to.....	1909 <sub>5280</sub>	“

Total number of miles improved in the South Div'n 41<sup>3783</sup><sub>5280</sub> miles.

## WEST DIVISION.

240,002	lineal ft. of wooden block pavement, equal to	45 <sup>1524</sup> <sub>5280</sub>	miles
39,541	“ of cindering, equal to.....	7 <sup>2581</sup> <sub>5280</sub>	“
13,920	“ of graveling, equal to.....	2 <sup>3360</sup> <sub>5280</sub>	“
15,903	“ of macadamizing, equal to.....	3 <sup>63</sup> <sub>5280</sub>	“

Total number of miles improved in the West Div'n 58<sup>2318</sup><sub>5280</sub> miles.

The following list shows the total of assessments made in each year since 1861:

For the year ending April 1, 1862.....	\$ 42,635.49
For the year ending April 1, 1863.....	46,493.67
For the year ending April 1, 1864.....	389,169.31
For the year ending April 1, 1865.....	103,576.35
For the year ending April 1, 1866.....	802,574.56
For the year ending April 1, 1867.....	317,206.18
For the year ending April 1, 1868.....	1,354,436.48
For the year ending April 1, 1869.....	2,395,683.03

For the year ending April 1, 1870.....	2,836,852.48
For the year ending April 1, 1871.....	2,359,835.89
For the year ending April 1, 1872.....	62,222.25
For the year ending April 1, 1873.....	<hr/>
For the year ending April 1, 1874.....	749,460.27
For the year ending April 1, 1875.....	723,254.42
For the nine months ending January 1, 1876.....	60,585.72
For the year ending January 1, 1877.....	1,516,081.07
Total for sixteen years.....	<hr/> \$13,760,067.17

SIDEWALKS.

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On the first of January, 1876, the report of the Superintendent of Sidewalks showed 648 miles of sidewalks in the city.

During the past year the construction of new walks have been as follows:

	Lineal Feet.
Stone.....	7,039
Concrete.....	7,918
Plank.....	117,736
	<hr/>
	132,693

Or 25<sup>693</sup>/<sub>5280</sub> miles, making, at this date, a total of 673<sup>693</sup>/<sub>5280</sub> miles of sidewalk in the city.

Respectfully submitted,

H. J. JONES,

*In charge of Special Assessments.*

# FINANCIAL STATEMENT

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TO THE HON. MONROE HEATH, *Mayor,*

*And in Charge of the Department of Public Works,*

DEAR SIR.—I herewith respectfully submit my report of the receipts and expenditures by the Department of Public Works from January 1st, 1876, to December 30, 1876, inclusive.

## TRIAL BALANCE LEDGER, DEPARTMENT OF PUBLIC WORKS, DECEMBER 30, 1876.

	DR.	CR.
Water Works .....	\$ 4,588,820.30	
Water Works Income .....		\$7,559,575.98
Water Fund in hands of City Treasurer .....	267,512.73	
General Taxes .....		430,000.00
Water loan bonds, 6 per cent..		921,000.00
Water loan bonds, 7 per cent..		3,660,000.00
Water loan bonds, cancelled...		239,000.00
Water loan interest .....	3,090,311.26	
Water Works, expenses and re- repairs .....	3,342,311.39	
Duncan, Sherman & Co .....	16,065.00	
Water Works, coal .....	223.12	
Water Works, stock .....	29,318.00	
Amount carried forward...	\$11,334,561.80	\$12,809,575.98

Amount brought forward...	\$11,334,561.80	\$12,809,575.98
New lake tunnel .....	414,709.36	
American Exchange Nat'l Bank	147,172.11	
Water Works, new engine ....	184,279.01	
Land extension, new lake tunnel	542,912.63	
New pumping works.....	252,660.39	
Water service cocks .....	2,015.91	
Certificates of indebtedness....		69,235.23
E. M. Johnson.....	500.00	
Water tax fund in hands of City Treasurer.....	270,797.47	
Certificates of indebtedness....		221,497.31
A. B. Miner and A. C. Reed ..		4,000.00
F. E. Canda & Co.....		1,342.66
Ogden, Sheldon & Co.....		2,767.43
G. A. Seaverns.....		1,856.59
Burnett, Todd & Cochran.....		250.00
C. H. McCormick & Bro .....		5,210.49
John Tyrell.....		150.00
Wm. Grayden.....		250.00
D. Kreigh & Co .....		711.92
S. J. Bushnell.....		250.00
W. D. Kerfoot.....		358.98
I. R. Hitt .....		25.00
E. E. Howard.....		100.00
T. Parker.....		150.00
A. M. Jones.....		61.31
A. P. Downs & Co.....		50.00
R. L. Root .....		67.54
D. R. Dyche.....		50.00
F. S. Baird.....		15.00
O. S. Hinds .....		175.00
Amount carried forward....	\$13,149,608.68	\$13,118,149.44

	Dr.	Cr.
Amount brought forward..	\$13,149,608.68	\$13,118,149.44
S. C. Hayes.....		25.00
S. L. Brown.....		50.00
Potwin & Corby.....		113.01
J. B. Drake.....		150.00
J. A. Hamilton and E. N. Taylor		4,248.63
W. Little.....		100.00
J. B. Hobbs.....		100.00
David Kreigh.....		250.00
E. H. Castle.....		150.00
Sidney Meyers.....		250.00
Water pipe account.....	23,962.74	
Chicago & North-Western R.R		10,000.00
Water Works.....	2,195,776.90	
General taxes.....		2,235,761.24
Sewerage fund in hands of City Treasurer.....	56,500.46	
Sewerage sinking fund.....		68,341.55
Sewerage sinking fund in hands of City Treasurer.....	55,088.16	
Sewerage loan interest.....	6,381.47	
American Exchange Nat'l Bank	88,964.53	
Certificates of indebtedness....		166,500.00
Stock account.....	1,482.00	
Rebates on sewerage taxes....	40,950.90	
Galena & Chicago Union R.R. Co		382.55
Chicago, Burlington & Quincy R. R.....		6,744.01
House drains.....		7,399.41
Sewerage tax fund in hands of City Treasurer.....	437,579.64	
Sewers, North Division.....	972,102.18	
Amount Carried forward..	\$17,028,397.66	\$15,618,715.84

	Dr.	Cr.
Amount brought forward..	\$17,028,397.66	\$15,618,715.84
Sewers, South Division . . . . .	1,287,373.35	
Sewers, West Division . . . . .	2,399,772.03	
Sewerage loan bonds, 6 per cent.		87,000.00
Sewerage loan bonds, 7 per cent.		2,550,000.00
Sewerage loan bonds, cancelled		363,000.00
Certificates of indebtedness . . . .		102,686.32
Covers account . . . . .	1,366.00	
Pipe account . . . . .	3,691.29	
Brick account . . . . .	2,030.00	
General taxes, sewerage . . . . .		2,065,545.26
S. Lynd, Treasurer Sewerage		
Commissioners . . . . .	109,245.48	
Dennis Coughlin . . . . .	1,561.51	
B. McMahon . . . . .		200.00
O. B. Hinton . . . . .		428.75
E. N. Taylor and J. A. Hamilton		15,596.77
A. Jacobson and P. Tallman . . .		2,000.00
A. Jacobson . . . . .		2,000.00
C. A. Gregory . . . . .		4,000.00
R. DeBaptiste . . . . .		15.00
F. Kneeland . . . . .		31.25
H. Greenebaum, Treasurer . . . .		4,500.00
A. M. Furrier . . . . .		240.00
A. A. Dewey . . . . .		235.00
N. DeGolyer . . . . .		280.00
N. C. Horse R. R. Co . . . . .		752.00
C. B. Farwell . . . . .		265.30
J. E. Aweley . . . . .		264.00
E. Gaylord . . . . .		730.50
C. W. Rigdon . . . . .		1,732.50
G. E. Adams . . . . .		205.63
Amount carried forward . . . .	\$20,833,437.32	\$20,820,424.12



	Dr.	Cr.
Amount brought forward...	\$20,833,437.32	\$20,820,424.12
H. Potwin.....		354.73
E. S. Dreyer.....		530.56
Jos. Eastman.....		811.36
J. K. Killon.....		32.37
J. C. Clemont.....		66.91
J. V. Spear.....		69.07
Potwin & Corby.....		211.50
H. Potwin.....		182.45
West Div. R. R. Co.....		3,000.00
S. W. Rawson.....		4,996.83
Daniel Lane.....		608.33
A. Mussmann.....		228.75
T. McHugh.....		279.61
J. P. Dickey.....		309.50
J. B. Langan.....		548.05
J. & J. F. Duffy.....		173.06
B. Langan.....		121.17
James McNichols.....		256.30
John McNichols.....		232.65
Appropriation fund in hands of City Treasurer.....	559,133.69	
North Division.....		7,276.07
South Division.....		6,535.54
West Division.....		25,504.41
Special assessments.....		277.62
City office expenses.....		3,290.34
Public buildings.....		5,031.48
Public library.....	2,500.00	
Sidewalks, North Division....		932.73
Sidewalks, South Division.....		1,340.06
Sidewalks, West Division.....		2,604.58
Amount carried forward...	\$21,395,071.01	\$20,886,230.15

	Dr.	Cr.
Amount brought forward...	\$21,395,071.01	\$20,886,230.15
Washington park.....		78.48
Ellis park.....		105.16
Dearborn park.....	465.99	
Lake park.....	84.13	
Congress park.....		250.00
Union park.....		191.62
Jefferson park.....		189.00
Vernon park.....		314.58
Wicker park.....		1,199.21
Campbell park.....		934.50
Washington street tunnel.....		1,380.90
LaSalle street tunnel.....		1,729.26
Confiscated property.....		356.08
Street signs.....		82.74
Public hydrants.....		266.30
F. J. Reed, Cy.....	308.12	
Warrant No. 480.....		308.12
City proportional expense.....		1,401.67
Pounds.....		22.56
Public benefits.....		53,528.49
Street lamps.....	2,957.02	
Land damages at Polk street bridge.....		1,770.00
Land damages at Eighteenth street bridge.....		8,900.00
Land damages at Twenty-sec- ond street bridge.....	28.14	
Land damages at Rush street bridge.....		1,652.34
Land damages at N. Halsted street bridge.....		8,000.00
Amount carried forward...	\$21,398,914.41	\$20,968,891.16

	Dr.	Cr.
Amount brought forward..	\$21,398,914.41	\$20,968,891.16
Land damages at Harrison street bridge .....		36,000.00
Land damage at C. & A. R. R. bridge .....		5,000.00
Chicago harbor. ....		6,121.00
Bridge tenders' salaries.....	6,586.67	
Bridge department.....		6,417.59
Fullerton avenue bridge.....		2,882.50
Harrison street bridge.....		19,806.25
Thirty-fifth street bridge.....		144.29
North avenue bridge.....		35,000.00
Clybourn place bridge.....	13,717.22	
Randolph street bridge .....		3.42
Fourteenth street bridge.....		20,000.00
Kinzie street bridge.....		3,000.00
Thirty-ninth street bridge.....		500.00
House and street permits.....		1,735.82
City hall plans.....		31.32
Twelfth street viaduct.....		3,267.58
Halsted street viaduct.....	8,612.96	
Eighteenth street viaduct.....		25,000.00
Indiana street viaduct.....		2,468.00
Blue Island avenue viaduct....		13,683.15
Milwaukee avenue viaduct....		37,728.48
Cleaning North Branch.....	33,169.28	
Bathing houses .....		4,000.00
Opening Fourteenth street.....		35,000.00
Certificates of indebtedness ....		347,880.38
Interest on do.....	144,969.69	
House numbers.....	21.08	
Ogden ditch dam.....		1,430.37
Amount carried forward...	\$21,605,991.31	\$21,575,991.31

	Dr,	Cr.
Amount brought forward..	\$21,605,991.31	\$21,575,991.31
Water Works .....		30,000.00
City Hall fund .....	21,400.00	
McKinney & Doyle.....	3,600.00	
City Hall appropriation.....		25,000.00
American Exchange Bank.....	90,137.69	
River improvement loan interest		123,819.60
River improvement sinking fund		50,827.08
River improvement sinking fund in hands of Treasurer.....	50,827.08	
River improvement bonds, 7 per cent .....		2,621,000.00
River improvement bonds, can- celled.....		379,000.00
River improvement certificates of indebtedness.....		272,976.98
Cost of deepening Illinois and Michigan Canal.....	3,306,658.89	
LaSalle street tunnel bonds....		565,228.52
Cost of LaSalle street tunnel...	565,228.52	
City Hall bonds.....		457,000.00
Cost of City Hall .....	457,000.00	
City Bridewell fund.....	13,132.76	
City Bridewell bonds.....		385,000.00
Cost of City Bridewell .....	371,867.24	
	<hr/>	<hr/>
	\$26,485,843.49	\$26,485,843.49

WATER FUND.

STATEMENT of the Receipts by the Department of Public Works, from January 1st, 1876, to December 30th, 1876, inclusive, and detailed statement of Expenditures during the same time.

RECEIPTS.

Received from water tax collected . . .	\$833,963.78	
Received from temporary loans . . . . .	599,846.30	
Received from general taxes . . . . .	391,865.19	
Received for labor and material . . . . .	26,493.01	
Received for making hydrants and stop cocks . . . . .	12,288.14	
Received for tapping pipes . . . . .	6,454.90	
Received for letting on water . . . . .	1,458.25	
Received for meter connections . . . . .	879.82	
Received for interest refunded . . . . .	848.67	
Received for iron sold . . . . .	6,136.68	
Received for voucher canceled . . . . .	17.44	
Total receipts . . . . .		\$1,880,252.18

EXPENDITURES.

ADDITIONS TO WATER WORKS.

DISTRIBUTING PIPES AND  
SUPPLY MAINS LAID.

	Cash Payments.	True Cost.
For cast iron pipe . . . . .	\$ 9,791.23	
Labor laying pipe . . . . .	37,680.50	
Special castings . . . . .	16,086.97	
Lead used . . . . .	8,839.91	
Brick used . . . . .	3,475.89	
Building pipe tunnel . . . . .	6,422.79	
Amount carried forward . . . . .	\$82,297.29	

	Cash Payments,	True Cost
Amount brought forward.	\$82,297.29	
Hauling pipe . . . . .	1,602.00	
Cement . . . . .	2,340.67	
Lumber . . . . .	1,063.12	
Gasket . . . . .	203.42	
Hardware . . . . .	369.87	
Keeping horses . . . . .	470.65	
Taps . . . . .	976.43	
Sand . . . . .	241.42	
Rebates . . . . .	415.89	
Damage to Sewer . . . . .	485.98	
Plumbing . . . . .	869.91	
Saw Dust . . . . .	111.00	
Oil . . . . .	66.27	
Royalty on Hydrants..	33.00	
Lanterns and Repairs..	72.25	
Advertising . . . . .	19.13	
Inspecting Valves . . . . .	50.00	
For new hydrants and stop cocks . . . . .	11,783.46	
	<u>\$103,471.64</u>	
ADD—		
For laying pipe for which money was advanced.	15,297.92	
DEDUCT—		
Amount received for la- bor and material . . . . .	31,771.80	
	<u>16,473.88</u>	
		\$86,997.76
NEW PUMPING WORKS.		
Labor . . . . .	\$23,005.84	
Masonry work . . . . .	33,416.37	
	<u>\$56,422.21</u>	
Amount carried forward.	\$103,471.64	\$86,997.76

		Cash Payments.	True Co
Amount brought forward	\$ 56,422.21	\$103,471.64	\$86,997
Cut stone work . . . . .	10,868.90		
Foundations . . . . .	14,656.40		
Iron roof and roofing..	20,249.37		
Terra cotta work . . . . .	6,345.00		
Iron work . . . . .	5,092.08		
Stand pipe . . . . .	2,969.00		
Castings . . . . .	4,543.56		
Brick . . . . .	2,804.90		
Mud drum . . . . .	1,000.00		
Painting . . . . .	1,365.43		
Steam fitting . . . . .	1,895.25		
Tile floor . . . . .	1,426.23		
Lumber . . . . .	1,554.62		
Cement and Lime . . . . .	1,443.33		
Sewer pipe . . . . .	229.95		
Fire brick . . . . .	828.85		
Pumping out tunnel . . .	636.25		
Waste gate . . . . .	1,009.00		
Pump . . . . .	850.00		
Plumbing . . . . .	296.17		
Advertising . . . . .	223.78		
Hardware . . . . .	629.07		
Gas fitting and fixtures .	547.44		
Drill rods . . . . .	473.70		
Coal . . . . .	310.01		
Pully blocks . . . . .	365.95		
Labor . . . . .	634.99		
Valves . . . . .	450.00		
Gas . . . . .	162.00		
Freight . . . . .	104.00		
Rope . . . . .	101.14		
Amount carried forward	\$140,488.58	\$103,471.64	\$86,997.7

		Cash Payments.	True Cost.
Amount brought forward	\$140,488.58	\$103,471.64	\$86,997.76
Sand . . . . .	200.00		
Rent of storage lot . . . . .	159.85		
Packing . . . . .	167.88		
Lead . . . . .	30.52		
Car fare . . . . .	28.00		
Covering boiler . . . . .	54.00		
Use Pump . . . . .	25.00		
Stationery . . . . .	22.20		
Blow off . . . . .	110.00		
Gas pipe . . . . .	158.33		
Spawls . . . . .	91.60		
Barrows . . . . .	24.00		
Scales . . . . .	129.75		
Clock . . . . .	25.00		
Oil . . . . .	58.07		
Testing boiler . . . . .	30.00		
Bedstead and fixtures . . . . .	38.70		
Moving testing press . . . . .	75.00		
	<hr/>	141,916.48	
ADD—			
For labor at shops in 1876	323.62		142,240.10
WATER WORKS NEW ENGINE.			
Paid Murphy & Co., contractors . . . . .		20,763.40	20,763.40
LAKE TUNNEL EXTENSION.			
Paid W. D. Cox, contractor . . . . .	1,019.33		
Paid for damages . . . . .	100.00		
	<hr/>	1,119.33	1,119.33
Amount carried forward . . . . .		\$267,270.85	\$251,120.59



	Cash Payments.	True Cost.
Amount brought forward	\$267,270.85	\$251,120.59

## LAKE TUNNEL CRIB.

Labor.....	1,616.00
Use of Tug.....	1,226.38
Preparing telegraph....	79.89
Use of scow.....	499.40
Building house.....	350.00
Doors and frames.....	248.43
Bedsteads and bedding..	121.60
Hardware.....	139.84
Striking machine.....	275.00
Coal.....	187.00
Plastering.....	117.00
Galvanized iron.....	170.75
Lumber.....	148.27
Lime and cement.....	139.40
Brick.....	269.50
Diving.....	50.00
One boat.....	75.00
Advertising.....	58.09
Roofing.....	147.80
Iron work.....	77.60
Vitriol.....	32.60
Lantern.....	2.50
Paint and oil.....	60.90
Stove and pipe.....	52.20
Sand.....	41.25
Rope and brooms.....	14.45
Plumbing.....	65.85
Glass.....	2.75
Groceries.....	15.37

Amount carried forward.	\$6,284.82	\$267,270.85	\$251,120.59
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		Cash Payments.	True Cost.
Amount brought forward	\$6,284.82	\$267,270.85	\$251,120.59
Boarding . . . . .	18.75		
Chain, etc . . . . .	31.47		
	<hr/>	6,335.04	
ADD—			
Labor at shops in 1876	206.96		6,542.00
		<hr/>	<hr/>
Total additions to Water Works . . . . .		\$273,605.89	\$257,662.59

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## WORKING EXPENSES AND REPAIRS.

### NORTH SIDE PUMPING WORKS AND SHOPS.

		Cash Payments.	True Cost.
For 15,754 tons of coal..	\$111,630.16		
Labor . . . . .	31,004.15		
Two pumps . . . . .	7,600.00		
Gas . . . . .	1,488.40		
Castings . . . . .	3,791.08		
Repairing roof . . . . .	438.15		
Lumber . . . . .	272.12		
One boiler . . . . .	341.75		
Iron, steel and bolts . . . . .	504.77		
Repairing boilers . . . . .	732.74		
Horse feed . . . . .	863.69		
Oil . . . . .	721.94		
Steam pipe . . . . .	341.33		
Packing . . . . .	127.37		
Lead . . . . .	264.31		
Waste . . . . .	134.77		
Bloss coal . . . . .	117.00		
Iron work . . . . .	167.27		
	<hr/>		
Amount carried forward.	\$160,541.00		

	Cash Payments.	True
Amount brought forward	\$160,541.00	
Belting.....	8.24	
Filling.....	9.60	
Mercury.....	5 00	
Cement.....	6.50	
Compound.....	19.10	
Horse shoeing.....	20.75	
Steam trap.....	60.00	
Repairing harnesses....	36.20	
Ice.....	12.30	
Stationery.....	5.00	
Hardware.....	67.96	
Stone.....	15.00	
Glass.....	49.11	
Paint.....	7.70	
Advertising.....	26.78	
Repairing Telegraph...	18.50	
Hose.....	15.00	
	<hr/>	160,923.74
ADD—		
For coal used at shop...	202.26	
	<hr/>	
DEDUCT—		
Amount received for la-		
bor and material.....	795.82	
Amount received for		
making hydrants and		
stop cocks at shops...	12,288.14	
Iron sold.....	62.07	
Labor at shops repairing		
tools, etc., for the sev-		
eral departments.....	1,814.93	
	<hr/>	
	\$14,960.96	
	<hr/>	
Amount carried forward	\$14,960.96	\$160,923.74

		Cash Payments.	True Cost.
Amount brought forward	\$14,960.96	\$160,923.74	
Less, as above	202.26		
	<hr/> 14,758.70		\$146,165.04

## WEST SIDE PUMPING WORKS.

Coal used . . . . .	\$5,268.68		
Labor . . . . .	2,372.91		
Rope, blocks, etc . . . . .	119.31		
Oil . . . . .	471.23		
Packing . . . . .	152.28		
Gas . . . . .	263.80		
Castings . . . . .	77.60		
Barrows . . . . .	80.00		
Waste . . . . .	54.05		
Brooms . . . . .	3.25		
Alcohol . . . . .	9.60		
Tallow . . . . .	18.81		
	<hr/>	8,891.52	8,891.52

## OFFICE EXPENSE AND SALARIES.

Salary of Commissioners			
paid from water . . . . .	\$6,474.93		
Salary of secretary paid			
from water . . . . .	1,895.81		
Salary of city engineer			
paid from water . . . . .	2,420.88		
Salary of superintendent			
paid from water . . . . .	1,633.31		
Salary of book-keeper			
and clerks paid from			
water . . . . .	13,362.14		
Salary of water collectors			
paid from water . . . . .	6,300.00		
	<hr/>	<hr/>	<hr/>
Amount carried forward	\$32,087.07	\$169,815.26	\$155,056.56

		Cash Payments.	True Cost
Amount brought forward	\$32,087.07	\$169,815.26	\$155,056
Salary of assessor and assistants paid from water .....	8,249.15		
Stationery .....	492.45		
Printing .....	522.65		
Printing 15th annual re- port .....	251.30		
Advertising .....	117.72		
Miscellaneous cash items	239.92		
Car Fares .....	108.32		
Hardware .....	55.35		
Furniture .....	8.00		
Directory .....	8 33		
Bridges .....	21.00		
Engraving .....	17.00		
	<u>          </u>	42,178.26	
ADD—			
For labor at shops in 1876 .....	95.17		
DEDUCT—			
Amount received for voucher canceled .....	17.44		
	<u>          </u>		
	77.73		42,255.9
REPAIRS OF PIPES, HY- DRANTS, STOP COCKS, AND MISCELLANEOUS OPERATING EXPENSES.			
Labor .....	\$66,716.82		
Lumber .....	871.86		
Castings .....	730.52		
Improving Chicago ave..	436.35		
	<u>          </u>		
Amount carried forward	\$68,755.55	\$211,993.52	\$197,312.51

		Cash Payments.	True Cost.
Amount brought forward	\$68,755.55	\$211,993.52	\$197,312.55
Iron work.....	208.81		
Hardware .....	200.04		
Paving blocks.....	250.79		
Lead .....	197.12		
Cement .....	343.64		
Horse feed .....	164.66		
Horse shoeing.....	12.39		
Repairing wagon.....	16.79		
Repairing harness.....	17.00		
Hauling water.....	108.00		
Sawdust .....	54.50		
Plumbing.....	93.32		
Rent of barn.....	50.00		
Oil .....	59.15		
Lanterns.....	5.00		
Boots .....	15.00		
Salt .....	17.70		
	<hr/>	70,569.46	

## DEDUCT—

Amount received for let-

ting on water..... 1,458.25

69,111.21

## WATER METERS.

Labor .....	6,308.40
New meters put in use..	5,052.00
Brass castings .....	2,148.72
Salary of meter clerk....	1,345.88
Hardware .....	100.60
Meter counters.....	63.50
Freight on meters.....	106.47
Sawdust .....	318.57
Lumber .....	245.41

Amount carried forward	\$15,689.55	\$282,562.98	\$266,421
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		Cash Payments.	True Cost.
Amount brought forward	\$15,689.55	\$282,562.98	\$266,423.76
Plumbing . . . . .	84.44		
Candles . . . . .	45.00		
Horse shoeing . . . . .	66.01		
Horse feed . . . . .	40.29		
Oil . . . . .	1.50		
Repairing wagon . . . . .	28.00		
Use of horse . . . . .	23.40		
Repairing harness . . . . .	11.00		
Packing . . . . .	14.23		
	<hr/>	16,003.42	
ADD—			
For labor at shops in 1876	152.90		
DEDUCT—			
Amount received from water meter connec'ns	879.82		
	<hr/>		
	726.92		15,276.50
WATER WORKS INCOME.			
Water tax refunded . . . . .		123.42	
		<hr/>	<hr/>
Total operating expenses		\$298,689.82	\$281,700.26

### WATER LOAN INTEREST.

	Cash Payments.	True Cost.
Interest on water loan bonds due July 1st, 1876, paid by Merch'nts Nat'l Bank . . . . .	\$155,580.08	
Remittance to American Exchange Nat'l Bank, for balance of July int.	3,488.70	
	<hr/>	
Amount carried forward	\$159,068.78	

	Cash Payments.	True Cost.
Amount brought forward	\$159,068.78	
Interest on water bonds		
for January, 1877 . . . . .	143,723.41	
Coupons paid by City		
Treasurer . . . . .	12,215.00	
Interest paid on temporary loans . . . . .	36,120.84	
	<u>351,128.03</u>	
ADD—		
Amount transferred from discount account . . . . .	44,527.73	
DEDUCT—		
Amount rec'd for interest	4,179.96	
	<u>\$40,347.77</u>	\$391,475.80

## WATER MISCELLANEOUS EXPENSE.

## WATER SERVICE COCKS.

	Cash Payments.	True Cost.
Labor . . . . .	\$6.928.11	
Taps . . . . .	1,989.67	
Salary of permit clerk . . . . .	1,262.53	
Shoeing horses . . . . .	27.00	
Repairing harness . . . . .	41.25	
Repairing wagon . . . . .	21.39	
Water boxes . . . . .	181.83	
Feed for horses . . . . .	30.98	
Oil . . . . .	3.45	
	<u>10,486.21</u>	
ADD—		
For coal used . . . . .	\$8.70	
Expense of keeping horses . . . . .	1,036.28	
	<u>1,044.98</u>	
Amount carried forward . . . . .	\$10,486.21	



	Cash Payments.	True Cost.
Amount brought forward	\$10,486.21	
DEDUCT—		
Amount received for tapping . . . . .	6,454.90	
	<u>5,409.92</u>	\$5.076.29
COAL ACCOUNT.		
Coal purchased . . . . .	114,956.00	
DEDUCT—		
Amount charged sundry accounts . . . . .	111,841.12	3,325.84
		3,325.84
CERTIFICATES OF INDEBTEDNESS.		
Temporary loans paid . . . . .	870,140.98	
DEDUCT—		
Amount received for temporary loans . . . . .	1,160,873.52	
	<u>                    </u>	<u>                    </u>
Total miscellaneous expense . . . . .	\$883,953.03	\$8,402.13
WATER FUND RECAPITULATION.		
	Cash Payments.	True Cost.
Total additions to water-works brought forward	\$273,605.89	\$257,662.59
Total operating expense brought forward . . . . .	298,689.82	281,700.26
Total water loan interest brought forward . . . . .	351,128.03	391,475.80
Total miscellaneous expense brought forward	<u>883,953.03</u>	<u>8,402.13</u>
Total cash expenditure.	\$1,807,376.77	\$939,240.78

NOTE.—Of the above cash expenditure, \$870,140.98 was for temporary loans paid.

## SEWERAGE FUND.

STATEMENT of Receipts by the Department of Public Works,  
and detailed statement of Expenditures from January 1st,  
1876, to December 30th, 1876, inclusive.

## RECEIPTS.

Amount of appropriation for 1876,	\$475,266.94	
Received from temporary loans..	236,840.00	
Received from vouchers canceled issued for payment of temporary loans .....	158,378.55	
Received from permits issued....	16,492.79	
Received from labor and material	350.40	
	<hr/>	
Total receipts .....		\$887,328.68

## EXPENDITURES.

## STOCK ACCOUNT.

		Cash payments.	True Cost.
Repairing wagon.....	\$198.90		
Machine for examining sewers .....	50.00		
Rope.....	2.50		
Oakum.....	5.50		
Tools.....	15.31		
Pails.....	24.00		
Hardware .....	11.75		
Measuring tape.....	18.00		
Hoes.....	50.00		
	<hr/>	\$375.96	
DEDUCT—			
Amount carried forward for depreciation in tools to sundry accounts...	234.31		141.65
	<hr/>		<hr/>
Amount carried forward		\$375.96	\$141.65

	Cash Payments.	True Cost.
Amount brought forward	\$375.95	\$141.65

## HOUSE DRAINS.

Salary of inspectors....	5,558.14	
Salary of draughtsman.	2,827.62	
Sewer pipe.....	692.85	
Cement.....	2.34	
	<hr/>	\$9,080.95

## DEDUCT—

Amount received for permits.....	16,492.79	
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## STREET INTERSECTIONS.

Labor.....	7,720.60	
Cement.....	1,698.24	
Brick.....	2,523.91	
Lumber.....	605.17	
Sand.....	270.00	
Horse keeping.....	174.88	
Covers.....	622.00	
Pipe.....	118.50	
	<hr/>	13,733.30

## DEDUCT—

Amount received for labor and material.....	350.40	13,382.90
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## REPAIRS NORTH DIVISION.

Labor.....	929.65		
Cement.....	74.74		
Lumber.....	25.73		
Brick.....	88.55		
Covers.....	183.04		
Pipe.....	4.00		
	<hr/>	1,305.71	1,305.71
Amount carried forward...		<hr/> \$24,495.92	<hr/> \$14,830.26

	Cash Payments.	True Cost.
Amount brought forward	\$24,495.92	\$14,830.26

## REPAIRS SEWERS SOUTH

## DIVISION.

Labor .....	1,535.84		
Cement .....	56.85		
Brick .....	189.35		
Lumber .....	25.73		
Covers used .....	291.84		
Pipe used .....	3.00		
	<hr/>	2,102.61	2,102.61

## REPAIRS SEWERS, WEST

## DIVISION.

Labor .....	1,886.66		
Sand .....	37.50		
Cement .....	212.64		
Brick .....	179.90		
Lumber .....	25.73		
Covers used .....	306.24		
Pipe used .....	13.00		
	<hr/>	2,661.67	2,661.67

## CLEANING SEWERS, NORTH

## DIVISION.

Labor .....	7,787.70		
Water used .....	337.68		
Repairing tools .....	7.27		
	<hr/>	8,132.65	

ADD—

For depreciation in tools	59.31		8,191.96
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## CLEANING SEWERS SOUTH

## DIVISION.

Labor .....	8,682.91		
Water used .....	346.29		
	<hr/>	<hr/>	<hr/>
Amount carried forward	\$9,029.20	\$37,392.85	\$27,786.50

		Cash Payments.	True
Amount brought forward	\$9,029.20	\$37,392.85	\$27,
Candles . . . . .	4.00		
Repairing tools . . . . .	7.27		
	<u>          </u>	9,040.47	
ADD—			
For depreciation in tools	75.00		9,1
CLEANING SEWERS, WEST DIVISION.			
Labor . . . . .	11,104.31		
Water used . . . . .	812.91		
Candles . . . . .	12.00		
Oil . . . . .	1.50		
Repairing tools . . . . .	7.26		
	<u>          </u>	11,937.98	
ADD—			
For depreciation in tools	100.00		12,03
OFFICE EXPENSE AND SALARIES.			
For salary of book-keepers and clerks . . . . .	6,794.94		
Stationery . . . . .	488.42		
Miscellaneous cash items	239.93		
Car fares . . . . .	108.33		
Printing . . . . .	109.76		
Printing 15th annual report . . . . .	251.30		
Badges . . . . .	3.00		
Oil . . . . .	3.45		
Advertising . . . . .	38.26		
Labor . . . . .	24.00		
	<u>          </u>	8,061.39	
Amount carried forward.	\$8,061.39	\$66,432.69	\$47,939

		Cash Payments.	True Cost.
Amount brought forward	\$8,061.39	\$66,432.69	47,939.95
DEDUCT—			
Amount received for voucher cancelled....	17.45		\$8,043.94
SEWERAGE SINKING FUND.			
Paid sewerage sinking fund, in hands of city treasurer, its portion of sewerage tax.....	1,000.00		
Paid river improvement sinking fund, in hands of city treasurer, its portion of sewerage tax.....	1,000.00		
	<hr/>	2,000.00	2,000.00
SEWERAGE LOAN INTEREST.			
Interest on bonds due July 1st, 1876, paid by Merchants Nat'l Bank	90,995.33		
Paid for collecting taxes	7,138.06		
Remittance to Am. Ex. Nat'l Bank for balance of July, 1876, interest	1,293.23		
Remittance to Am. Ex. Nat'l Bank for interest due January 1st, 1877,	88,019.50		
Interest paid in Chicago,	4,060.00		
Paid river improvement fund for its portion of sewerage tax.....	186,182.92		
Interest on temporary loans ... ..	40,864.17		
	<hr/>	418,553.21	418,553.21
Amount carried forward...		\$486,985.90	\$476,537.10

	Cash Payments.	True Cost.
Amount brought forward..	\$486,985.90	\$476,537.10

CERTIFICATES OF  
INDEBTEDNESS.

Temporary loans paid..	646,199.67	
DEDUCT		
Amount received for temporary loans.....	812,699.67	
Total expenditures.....	\$1,133,185.57	\$476,537.10

NOTE—Of the above cash expenditures, \$646,199.67 was for temporary loans paid.

. SEWERAGE TAX FUND.

STATEMENT of Receipts by the Department of Public Works,  
and detailed statement of Expenditures, from January 1st,  
1876, to December 30, 1876, inclusive.

RECEIPTS.

Appropriation by Common Council \$	16,000.00	
Received from temporary loans....	183,959.66	
Received from vouchers canceled issued for payment of temporary loans .....	16,909.86	
Labor and material for private par- ties.....	8,268.23	
Covers sold.....	2,044.41	
Brick sold.....	2,058.37	
Pipe sold.....	442.25	
Total receipts.....		\$229,682.78

## EXPENDITURES.

## SEWERS, NORTH DIVISION.

		Cash Payments.	True Cost.
Salary of engineers.....	\$1,864.23		
Labor.....	1,650.02		
Repairing tools.....	28.07		
Cement.....	77.03		
Horse keeping.....	19.39		
Sand.....	43.75		
Lumber.....	7.40		
	<hr/>	3,689.89	
ADD—			
For money advanced by private parties to build sewers.....	736.19		
Bricks used.....	30.00		
Pipe used.....	224.92		
Covers used.....	25.06		
Interest on temporary loans.....	6,056.52		
	<hr/>		
	\$10,742.58		
DEDUCT—			
Amount received for la- bor and material.....	149.24		
	<hr/>		
	\$10,593.34		\$14,283.23

## SEWERS, SOUTH DIVISION.

Labor.....	2,687.62		
Salary of engineers.....	1,273.35		
Repairing tools.....	28.82		
Cement.....	285.41		
Keeping horse.....	19.39		
Sand.....	73.75		
	<hr/>		
Amount carried forward	\$4,368.34	\$3,689.89	\$14,283.23



		Cash Payments.	True C
Amount brought forward	\$4,368.34	\$3,689.89	\$14,2
Plumbing . . . . .	2.00	.	
Lumber . . . . .	7.39		
Filling . . . . .	10.75		
Brick . . . . .	11.66		
	<hr/>	4,400.14	
ADD—			
For brick used . . . . .	429.42		
For pipe used . . . . .	1,395.90		
For covers used . . . . .	290.10		
For interest on tempo- rary loans . . . . .	8,032.58		
	<hr/>		
	\$10,148.00		\$14,54
SEWERS, WEST DIVISION.			
Labor . . . . .	4,538.78		
Constructing sewers . . . .	5,961.30		
Filling . . . . .	2,590.58		
Cement . . . . .	2,701.99		
Plumbing . . . . .	121.75		
Damages . . . . .	100.00		
Salary of assistant engi- neers . . . . .	1,603.38		
Repairing tools . . . . .	50.76		
Keeping horses . . . . .	278.66		
Cinders . . . . .	54.00		
Sand . . . . .	137.50		
Lumber . . . . .	32.51		
	<hr/>	18,171.21	
ADD			
For amount advanced by private parties to con- struct sewers . . . . .	20,159.07		
	<hr/>		
Amount carried forward.	\$20,159.07	\$26,261.24	\$28,831.

	Cash Payments	True Cost.
Amount brought forward.	\$20,159.07	\$26,261.24
For brick used.....	6,762.25	
For pipe used.....	1,295.60	
For covers used.....	1,461.00	
For interest on tempo- rary loans.....	14,797.00	
	<u>44,474.92</u>	

## DEDUCT —

Amount received for la- bor and material.....	8,262.33	
	<u>\$36,212.59</u>	\$54,383.80

CERTIFICATES OF INDEBT-  
EDNESS.

Temporary loans paid.. 605,235.98    605,235.98

## DEDUCT—

Amount received for  
temporary loans..... 707,922.30

## COVERS ACCOUNT.

Labor .....	1,146.24	
Lumber.....	1,783.47	
Freight.....	30.00	
	<u>2,959.71</u>	

## DEDUCT—

Amount received for cov-  
ers sold and charged  
sundry accounts..... 3,820.57

## SEWERAGE PIPE.

Labor .....	356.88	
Sewer Pipe.....	1,492.59	
	<u>1,849.47</u>	
Amount carried forward	<u>\$636,306.40</u>	<u>\$83,215 17</u>

	Cash Payments.	True Cost.
Amount brought forward	\$636,306.40	\$83,215.17
DEDUCT—		
Amount received for pipe sold and charged sun- dry accounts.....	3,358.67	
SEWERAGE BRICK.		
Brick purchased... ..	8,328.73	
Labor .....	966.31	
	<hr/>	
	9,295.04	
DEDUCT—		
Amount received for brick sold and charged sundry sewers.....	9,280.04	15 00
SEWERAGE TAX INTEREST.		
Interest paid on tempo- rary loans.....	29,525.91	
DEDUCT—		
Amount charged sewers, three divis- ions.....	28,886.10	
Amt. vouchers canceled... ..	639.81	\$29,525.91
SUNDRY SEWERS.		
Paid T. C. Boyd for con- structing sewer.....	70 00	70 00
Paid Geo. Smith for con- structing sewer.....	62 00	62 00
Paid John McNichols for constructing sewer...	300.00	300 00
Total expenditures.....	<hr/> \$675,559.35	<hr/> \$83,662.17

NOTE. —Of the above cash payments, \$605,235.98 was for temporary loans paid.

## DEPARTMENT OF PUBLIC WORKS APPROPRIATION FUND.

STATEMENT of the Receipts by the Department of Public Works, from January 1st, 1876, to December 30th, 1876, inclusive, and detailed statement of Expenditures during the same time.

### RECEIPTS.

Amount of appropriation by Common Council.....	\$523,335.05
Amount received from temporary loans .....	705,009.01
Amount received for special assessment expenses.....	21,183.80
Amount received for voucher canceled issued in payment of certificates of indebtedness, and returned to the office for cancellation .....	307,593.99
Amount received from R. R. Co.'s Blue Island Ave. viaduct.....	22,126.80
Amount received from R. R. Co.'s account Milwaukee Av. viaduct .....	15,720.94
Amount received from Cook Co. for heating.....	4,089.21
Amount received from Cook Co. for rent.....	3,300.00
Amount received for repaving...	2,102.97
Amount received for interest refunded.....	3,500.00
Amount carried forward.....	\$1,607,961.77

	Cash Payments.	True C
Amount brought forward...	\$1,607,961.77	
Amount received for bridge tend- ers salaries overpaid.....	1,610.00	
Amount received for permits....	712.50	
Amount received for keeping State street viaduct in repair.....	800.00	
Amount received for sale of engine	289.00	
Amount received for damages to bridge.....	12.50	
Amount received for iron fence..	65.00	
Amount received for steam pump	27.25	
Amount received for gas tips....	12.00	
Total receipts.....		\$1,611,49

## EXPENDITURES.

## NORTH DIVISION.

	Cash Payments.	True Co
Cleaning improv'd streets	\$1,576.34	
Cleaning and repairing unimproved streets...	22,970.93	
Lumber.....	780.97	
Tools, nails and hardware	201.20	
Gravel, McAdam and cinders.....	187.50	
Repairing tools.....	115.60	
Rent of Lumber yard...	120.66	
Tools .....	15.00	
	<u>25,968.20</u>	
DEDUCT—		
Amount received for re- paving .....	122.75	\$25,845
Amount carried forward....	<u>\$25,968.20</u>	<u>\$25,845</u>

		Cash Payments.	True Cost.
Amount brought forward		\$25,968,.20	\$25,845.45
SOUTH DIVISION.			
Cleaning improv'd streets	2,795.14		
Cleaning and repaving unimproved streets...	35,545.43		
Lumber .....	620.51		
Hardware .....	51.00		
Nails .....	305.99		
Gravel, McAdam and cinders .....	1,827.05		
Repairing tools .....	437.75		
Filling .....	4.05		
Keeping horses .....	80.00		
	<hr/>	41,666.92	
ADD—			
Amount transferred to Ellis Park .....	95.75		
DEDUCT—			
Amount received for re- paving .....	631.85		
	<hr/>		
	536.10		\$41,130.82
WEST DIVISION.			
Cleaning improv'd streets	2,952.39		
Cleaning and repairing unimproved streets...	31,022.39		
Lumber .....	1,740.65		
Hardware and nails .....	400.00		
Tools .....	108.84		
Gravel .....	508.90		
Macadam and cinders...	270.00		
Repairing tools .....	456.41		
	<hr/>		
Amount carried forward	\$57,459.58	\$67,635.12	\$66,976.27

		Cash Payments.	True Cost.
Amount brought forward	\$57,459.58	\$67,635.12	\$66,976.
Rent of lumber lot.....	195.00		
Advertising .....	68.41		
Keeping horse.....	80.00		
Miscellaneous expense paid in cash.....	50.00		
	<hr/>	57,852.99	
DEDUCT—			
Amount received for re- paving.....	1,348.37		56,504.
SIDEWALKS NORTH DIV'N.			
Salary of Superintendent	295.02		
Salary of Inspectors....	1,583.33		
Constructing walks.....	1,569.74		
Lumber.....	41.16		
Nails.....	16.50		
	<hr/>	3,505.75	
ADD—			
Amount transferred to Lake Park.....	1,000.00		
			4,505.7
SIDEWALKS SOUTH DIV'N.			
Salary of Superintendent	196.68		
Salary of Inspectors....	2,005.00		
Constructing walks.....	594.12		
Nails .....	9.30		
	<hr/>	2,805.10	
ADD—			
Amount transferred to Lake Park.....	1,500.00		
	<hr/>		4,305.10
Amount carried forward		\$131,798.96	\$132,291.7.

	Cash Payments.	True Cost.
Amount brought forward	\$131,798.96	\$132,291.74

## SIDEWALKS WEST DIV'N.

Salary of Superintendent	98.34	
Salary of Inspectors.....	3,466.95	
Constructing walks.....	608.86	
Lumber.....	369.09	
Nails.....	62.00	
Printing.....	46.00	
	<hr/>	4,651.24

ADD—

Amount transferred to		
Lake Park.....	4,000.00	8,651.24

## WASHINGTON PARK.

Labor.....	1,507.70	
Hardware.....	18.25	
Plumbing.....	16.70	
Grass seed.....	5.00	
	<hr/>	1,547.65
		1,547.65

## ELLIS PARK.

Labor.....	995.75	
Flower pots.....	17.90	
	<hr/>	1,013.65

LESS—

Amount transferred to		
south division.....	95.75	917.90
	<hr/>	<hr/>
Amount carried forward...	\$139,011.50	143,408.53



	Cash Payments.	True Cost.
Amount brought forward	\$139,011.50	\$143,408.53

## DEARBORN PARK.

Trees.....	478.00	
Steam Pipe.....	203.81	
Wire .....	25.55	
	<hr/>	707.36

LESS—

Amount received for iron

fence.....	64.50	642.86
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## LAKE PARK.

Labor.....	8,908.25	
Trees .....	1,633.00	
Sprinkling.....	180.00	
Filling.....	279.90	
Coal .....	13.40	
Rope.....	21.28	
Hardware .....	24.40	
Wire.....	25.55	
Lumber.....	49.24	
Repairing tools.....	64.38	
Gas fitting .....	17.90	
	<hr/>	11,217.30

LESS—

Amount received from

sidewalks .....	6,500.00	4,717.30
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## UNION PARK.

Labor .....	2,013.35	
Animal feed.....	517.92	
	<hr/>	
Amount carried forward	\$2,531.27	\$150,936.16
		<hr/>
		\$148,768.69

		Cash payments.	True Cost.
Amount brought forward	\$2,531.27	\$150,936.16	\$148,768.69
Coal .....	10.50		
Gravel .....	87.60		
Repairing mower .....	26.16		
Barrows .....	2.00		
Plumbing .....	15.40		
	<hr/>	2,672.93	2,672.93

## JEFFERSON PARK.

Labor .....	1,020.00		
Nails .....	8.75		
Lumber .....	3.95		
Feed for animals .....	47.59		
Plumbing .....	2.95		
Drain laying .....	10.25		
Coal .....	9.20		
	<hr/>	1,102.69	1,102.69

## VERNON PARK.

Labor .....	1,155.19		
Nails .....	12.90		
Lumber .....	50.27		
Plumbing .....	18.75		
Cleaning vault .....	24.00		
Oil .....	17.13		
Grass seed .....	9.35		
Coal .....	9.20		
	<hr/>	1,296.79	1,296.79

## WICKER PARK.

Labor .....	1,199.00		
Repairing mower .....	2.50		
	<hr/>	<hr/>	<hr/>
Amount carried forward	\$1,200.50	\$156,008.57	\$153,841.10

		Cash Payments.	True Co.
Amount brought forward	\$1,200.50	\$156,008.57	\$153,84
Lawn mower.....	29.50		
Plumbing .....	1.25		
Grass seed.....	5.55		
One Scythe .....	2.25		
	<hr/>	1,240.05	1,24

## CAMPBELL PARK.

Repairing mower.....	1.50
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PUBLIC BUILDINGS—CITY  
HALL.

Salary of engineer, fire- man, janitors and watchman .....	5,700.00		
Labor repairing building	2,378.32		
Gas used.....	2,519.85		
Coal used.....	2,562.79		
Lumber .....	451.57		
Paint and oil.....	511.48		
Steam fitting.....	488.24		
Plumbing .....	315.64		
Gas fitting.....	202.80		
Hardware .....	133.42		
Locks and keys.....	181.23		
Ice .....	222.16		
Soap and Matches.....	156.55		
Plastering.....	119.62		
Sash and doors.....	150.15		
Smoke stack.....	145.00		
Advertising.....	26.77		
Brooms and pails.....	61.50		
Cement .....	12.00		
	<hr/>	<hr/>	<hr/>
Amount carried forward.	\$16,339.09	\$157,250.12	\$155,082

		Cash Payments.	True Cost.
Amount brought forward	\$16,339.09	\$157,250.12	\$155,082.65
Repairing boiler . . . . .	60.84		
Ventilators . . . . .	20.00		
Repairing roof . . . . .	23.65		
Awnings . . . . .	48.00		
Furniture . . . . .	97.76		
Packing . . . . .	12.80		
Brick . . . . .	78.00		
Glass . . . . .	33.23		
Carpet . . . . .	25.30		
Moving safe . . . . .	34.00		
Iron work . . . . .	57.95		
	<hr/>	16,830.62	

## DEDUCT—

Amount received from			
Cook County rent . . . . .	3,300.00		
Amount received from			
Cook County heating . . . . .	4,089.21		
Amount received from			
sale of engine . . . . .	289.00		
Amount received from			
steam pump . . . . .	27.75		
	<hr/>		
	7,705.96		9,124.66

## SPECIAL ASSESSMENTS.

Salaries of clerks and en-			
gineers . . . . .	18,367.12		
Advertising . . . . .	2,456.00		
Salaries of special com-			
missioners . . . . .	5,147.00		
	<hr/>	<hr/>	<hr/>
Amount carried forward	\$25,970.12	\$174,080.74	\$164,207.31

		Cash Payments.	True Cost.
Amount brought forward	\$25,970.12	\$174,080.74	\$164,207.31
Notarial fees.....	287.25		
Court fees.....	427.21		
Lamp post.....	124.67		
Car fares.....	118.85		
Printing .....	70.75		
Stamps .....	75.00		
Stationery .....	97.45		
Hardware .....	12.50		
	<hr/>	27,183.80	

## DEDUCT—

Amount received for en-		
gineering.....	26,583.80	600.00

## CITY OFFICE EXPENSE.

Salary of clerks.....	3,701.62	
Stationery .....	694.14	
Draughtsman.....	726.66	
Miscellaneous cash items	239.95	
Car fares.....	108.35	
Printing .....	265.36	
Printing 15th annual re-	251.31	
port .....		
Badges .....	8.00	
Glazing.....	3.50	
Dusters.....	7.50	
	<hr/>	6,006.39

## DEDUCT—

Amount received for		
voucher cancelled.....	22.40	5,983.99
Amount carried forward.	\$207,270.93	\$170,791.30

	Cash Payments.	True Cost.
Amount brought forward	\$207,270.93	\$170,791.30

WASHINGTON STREET  
TUNNEL.

Salary of engineer and assistant .....	1,207.45		
Cleaning tunnel.....	626.88		
Gas fitting.....	37.34		
Oil .....	15.90		
Salt.....	14.20		
Iron work.....	42.68		
Coal.....	87.00		
Paving blocks.....	73.05		
Sewer pipe.....	24.44		
Alcohol.....	14.40		
Brooms.....	3.00		
	<hr/>	2,146.34	2,146.34

LA SALLE STREET TUNNEL.

Salary of engineer and assistants.....	1,213.13		
Cleaning tunnel.....	626.88		
Gas fitting.....	8.02		
Waste.....	2.00		
Castings.....	16.42		
Coal .....	38.70		
Oil.....	15.95		
Salt .....	1.45		
Lumber.....	65.94		
Plastering .....	75.00		
Alcohol .....	21.60		
Repairing boiler.....	9.23		
	<hr/>	2,094.32	2,094.32
Amount carried forward...	<hr/>	<hr/>	<hr/>
	\$211,511.59	\$175,031.96	

	Cash Payments.	True Co
Amount brought forward..	\$211,511.59	\$175,03

PUBLIC BENEFITS..

Improving intersections		
of streets.....	74,133.22	
Salary of Inspectors....	1,193.00	
Building wall.....	504.27	
Lumber .....	216.66	
Improving alleys.....	70.00	
	<hr/>	
	76,117.15	76,11

STREET LAMPS.

Lamps and Lanterns...	1,021.13	
Labor repairing lamps..	1,408.49	
Lamp posts.....	511.82	
Repairing lamps.....	705.62	
Glass.....	775.78	
Gas Burners.....	26.07	
Hardware .....	9.87	
Checks .....	47.80	
Tips.....	38.00	
Ladder .....	6.00	
	<hr/>	
	4,550.58	

LESS..

Amount received for tips		
sold .....	12.00	4,53

CHICAGO HARBOR.

Dredging .....	13,684.03	
Salary of harbor masters	3,447.13	
Use of tugs.....	529.00	
Pay roll.....	20.00	
Diving.....	40.00	
	<hr/>	
	17,720.16	17,720.
	<hr/>	<hr/>
	\$309,899.48	\$273,407.1

		Cash Payments.	True Cost.
Amount brought forward..		\$309,899.48	\$273,407.85
LAND DAMAGES AT ADAMS ST. BRIDGE.			
Paid Murray, Nelson & Co. damages to land..		2,939.00	2,939.00
LAND DAMAGES AT HARRI- SON ST. BRIDGE.			
Paid W. R. Page, land		2,000.00	2,000.00
STREET SIGNS.			
Salary of sign clerk....	225.00		
New signs.....	186.85		
Painting.....	2.50		
		414.35	414.35
PUBLIC HYDRANTS.			
Plumbing.....		256.04	256.04
POUNDS.			
Rent of pound lot.....		90.00	90.00
BRIDGE TENDER'S SALARIES.			
Amount paid for tending bridges.....		42,766.67	
LESS—			
Am't overpaid refunded	1,610.00		41,156.67
BRIDGE DEPARTMENT.			
Foreman and labor.....	9,564.47		
Coal.....	519.10		
Tools and hardware.....	74.48		
Amount carried forward	\$10,158.05	\$358,365.54	\$320,263.91



		Cash Payments.	True Cost.
Amount brought forward	\$10,158.05	\$358,365.54	\$320,263.91
Lumber .....	6,166.01		
Iron work .....	1,358.23		
Castings .....	64.94		
Brooms, matches and small stores .....	77.00		
Rope and oars .....	87.70		
Lanterns and repairs ....	49.38		
Nails and spikes .....	543.18		
Oil .....	394.01		
Bolts .....	143.46		
Stoves and repairs .....	36.90		
Use of tugs .....	129.00		
Dredging .....	75.00		
Rent of lot .....	450.00		
Driving piles .....	498.00		
Mason work .....	7.25		
Oakum .....	39.55		
Stone .....	62.75		
Filling .....	17.00		
	<hr/>	20,357.41	

## DEDUCT—

Amount received for keeping State st. via- duct in repair for two years .....	800.00		
Amount received for damages .....	12.50		
	<hr/>		
	812.50		19,544.91

## HALSTED ST. BRIDGE.

Labor .....	<hr/>	180.00	180.00
Amount carried forward.		<hr/> \$378,902.95	<hr/> \$339,988.82

	Cash Payments,	True Cost..
Amount brought forward.	\$378,902.95	\$339,988.82

## HARRISON ST. BRIDGE.

Paid American Bridge Co., est. No. 3.....	7,818.75	7,818.75
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## THIRTY-FIETH ST. BRIDGE.

Labor.....	180.71	180.71
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## MADISON ST. BRIDGE.

Labor.....	106.73	106.73
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BLUE ISLAND AVENUE  
VIADUCT.

Paid Cox Bros., contrac- tors.....	40,634.59	
Paid Keystone B'dge Co.	16,931.00	
Lumber.....	2,601.49	
Brick .....	1,874.23	
Salary of inspectors.....	562.50	
Sewerage work.....	238.20	
Nails.....	156.00	
Advertising.....	82.25	
Building wall.....	25.00	
Painting .....	21.00	
Cement.....	20.15	
Castings .....	65.68	
Nails.....	15.60	
	<hr/>	63,227.69

## DEDUCT—

Amount received from R. R. Co.'s.....	22,126.80	41,100.89
--	-----------	-----------

Amount carried forward	<hr/> \$450,236.83	<hr/> \$389,195.90
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	Cash Payments.	True Cost.
Amount brought forward	\$450,236.83	\$389,195.90

MILWAUKEE AV. VIADUCT.

Paid James Kincade contractor . . . . .	56,382.98	
Paid Amer. Bridge Co., Brick . . . . .	20,690.51	
Salary of Inspectors . . . .	6,003.25	
Lumber . . . . .	1,250.00	
Sewerage work . . . . .	481.51	
Cleaning vault . . . . .	482.97	
Constructing walk . . . . .	20.00	
Nails . . . . .	96.20	
Brick for sewerage . . . . .	55.00	
Cement . . . . .	280.60	
Gas fitting . . . . .	188.28	
Iron work . . . . .	39.58	
Plumbing . . . . .	66.18	
Advertising . . . . .	40.90	
	80.34	
	<u>86,158.30</u>	

DEDUCT—

Amount received from R. R. Co.'s . . . . .	15,720.94	70,437.36
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HALSTED ST. VIADUCT.

Lumber . . . . .	784.84	
Nails . . . . .	15.50	
	<u>800.34</u>	800.34

HOUSE MOVING AND STREET PERMITS.

Salary of special constables . . . . .	2,064.93	
Amount carried forward	<u>\$2,064.93</u>	<u>\$537,195.47</u> <u>\$460,433.60</u>

		Cash Payments.	True Cost.
Amount brought forward	\$2,064.93	\$537,195.47	\$460,433.60
Salary of Messenger....	300.00		
Salary of sidewalk In-			
specter .....	141.38		
Printing .....	4.00		
	<hr/>	2,510.31	1,797.81

## DEDUCT—

Amount received for	
permits .....	712.50

## CLEANING NORTH BRANCH.

## FULLERTON AV. CONDUIT.

## Paid Fitzsimmons &amp; Con-

nell, contractors.....	211,351.32		
Salary of Inspectors....	14,138.40		
Labor.....	215.00		
Oil.....	29.90		
Hardware.....	125.21		
Building office.....	180.00		
Globes.....	3.30		
Coal .....	24.30		
Cement.....	23.83		
Lanterns.....	27.25		
	<hr/>	226,118.51	226,118.51

## CERTIFICATES OF IN-

## DEBTEDESS.

Temporary loans paid..	1,676,754.91
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## DEDUCT—

Amount received for tem-	
porary loans .....	2,024,635.29

Amount carried forward	<hr/>	\$2,442,579.20	\$688,349.92
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	Cash Payments.	True Cost.
Amount brought forward...	\$2,442,579.20	\$688,349.92
INTEREST.		
Interest paid on temporary loans.....	103,265.85	
DEDUCT—		
Amount received for vouchers canceled....	17,616.19	85,649.66
HOUSE NUMBERS.		
Salary of draughtsman..	2,441.71	2,441.71
OGDEN DITCH DAM.		
Advertising .....	19.13	19.12
Total expenditure.....	\$2,548,305.89	\$776,460.42

•

## CITY BRIDEWELL FUND.

### EXPENDITURES.

	Cash Payments.	True Cost.
Steam fitting.....	141.37	
Roofing .....	92.31	
Labor.....	441.58	
Stone.....	1,504.90	
Lime.....	94.60	
Lumber.....	137.71	
Dredging .....	747.40	
Wire cloth.....	18.33	
Sand .....	87.13	
Iron.....	19.75	
	<u>3,285.08</u>	3,285.08

## RECAPITULATION.

	Cash Payments.	True Cost.
Water fund brought forward.....	\$1,807,376.77	\$939,240.78
Sewerage fund brought forward...	1,133,185.57	476,537.10
Sewerage tax fund brought forward	675,559.35	83,662.17
Appppropriat'n fund brought forward	2,548,305.89	776,460.42
City Bridewell fund brought forward	3,285.08	3,285.08
Total expenditures.....	<u>\$6,167,712.66</u>	<u>\$2,279,185.55</u>

Respectfully submitted,

E. M. JOHNSON,

*Accountant Department Public Works.*



SECOND ANNUAL REPORT

DEPARTMENT

# PUBLIC WORKS,

City Council of the City of Chicago

FOR THE YEAR 1871

DECEMBER 11 1871

PRINTED BY

JOHN S. F. GARDNER, 100 N. W. COR. OF ADAMS ST. CHICAGO







ED. BENTLEY'S PUBLICATIONS, 6 & 7, NASSAU ST., N.Y.



NEW CITY HALL

# SECOND ANNUAL REPORT

OF THE

DEPARTMENT

OF

# PUBLIC WORKS

TO THE

City Council of the City of Chicago,

FOR THE FISCAL YEAR ENDING

DECEMBER 31, 1877.



CHICAGO:

CLARK & EDWARDS, PRINTERS, 162 & 164 SOUTH CLARK STREET,  
1878.



429

# DEPARTMENT OF PUBLIC WORKS.

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## OFFICERS:

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MONROE HEATH, MAYOR.

D. S. MEAD, Sec'y.      E. S. CHESBROUGH, City Engineer.

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## DEPARTMENTAL:

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GEO. W. WILSON, *Sup't Streets and Bridges.*

WM. H. CLARKE, *Asst. City Engineer.*

E. M. JOHNSON, *Accountant and Paymaster.*

H. J. JONES, *In Charge Special Assessments.*

D. C. CREGIER, *Chief Engineer North Div. Pumping Works.*

HENRY MASON, *Engineer West Div. Pumping Works.*

W. R. LARRABEE, *In Charge of Water Office.*

O. F. WOODFORD, *Water Tax Assessor.*

CHAS. BROWN, *Sup't Water Meters.*

F. J. REED, *Cashier.*

F. C. MEYER, *In Charge of Map Department.*



# MAYOR'S REPORT.

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OFFICE OF THE DEPARTMENT OF PUBLIC WORKS, }  
CHICAGO, May 1st, 1878. }

*To the City Council of the City of Chicago:*

In presenting to your honorable body the second annual report the Department takes pleasure in informing you, that among the most important improvements which have been completed during the past year, are the Fullerton Avenue conduit, the Milwaukee Avenue and Desplaines Street viaduct, and the bridges erected over the Chicago River at Harrison Street, Fuller Street, N. Halsted Street and North Avenue.

This, together with less than the usual amount of sewerage construction, water pipe extension and general street improvements and repairs, will comprise the bulk of the work performed under the supervision of this Department, and the close of the year leaves no important public improvement under contract (excepting the construction of the foundations of the new City Hall) unfinished or incomplete.

In the management and execution of the works and improvements, under the immediate charge of the various departments, more than ordinary care and vigilance has been exercised in securing to the city the best possible return for the amount invested or expended. The sharp competition in prices for improvements under public lettings has enabled the city to



perform much work at greatly reduced rates, which has aided materially in accomplishing more than was anticipated under an appropriation greatly reduced from that of previous years. While a much larger fund could have been profitably expended, particularly in general street work, a strict adherence to the law requiring a reservation of fifteen per cent. of the amount of the appropriation has prevented the Department, to some extent, from placing our streets in a more desirable condition.

The new West Side pumping engines, of which a full description has been given in the last annual report, have continued regularly and uninterruptedly in the performance of their duty up to this date, furnishing the city with over 7,000,000,000 gallons of water, showing positive indications of meeting fully the expectation of the builders, as well as those having in charge this very important work. In compliance with the conditions of the contract the engineer and assistant were placed in charge of the machinery and paid by the contractors until May 1st, 1877, at which time a final estimate of \$60,333.22 was issued and the engines placed under full management and control of this department, which successfully completes one of the most important enterprises ever undertaken by the city.

The pumping engines of the North Division have passed through the year without incurring more than the usual amount of expense for improvements and repairs, and, at present, are in condition to perform all the service required; their work during the past year has been regular and reliable in furnishing 11,958,977,644 gallons, making the total amount supplied by the North and West Divisions pumping works about 19,000,000,000 gallons of water consumed, a daily average of 52,000,000 gallons.

The water thus bountifully supplied, of a quality, inferior to few if any cities' in the world, and from a fountain inexhaustible, lying at our very feet, requiring us only to provide means for

drawing from its boundless resources, is, in comparison with many cities less favored, in this respect, than Chicago, a boon of incalculable worth, entering as it does so largely in the health, happiness and prosperity of our city. With such facilities and such a supply at our command and with a rigid enforcement of all laws against a criminal and willful waste of water, our citizens may continue to enjoy a liberal allowance for domestic and all other purposes pertaining to health, comfort and convenience.

The following table exhibits the quantity and cost of pipes laid since 1861, including the cost of five river tunnels for carrying water mains to connect the three divisions of the city:

YEAR.	NO. OF FEET.	COST.
1861.....	13,761	\$ 12,008.00
1862.....	50,881	39,197.00
1863.....	68,691	51,205.00
1864.....	62,657	104,828.00
1865.....	73,494	146,332.23
1866.....	60,550	121,589.23
1867.....	128,519	246,420.53
1868.....	161,083	266,961.35
1869.....	167,504	514,652.54
1870.....	180,727	508,855.52
1871.....	91,129	316,165.19
1872.....	122,007	317,385.06
1873.....	214,657	579,287.30
1874.....	184,723	512,781.04
1875.....	124,493	468,002.28
1876.....	31,100	86,997.76
1877.....	45,870	90,511.43
<hr/>		<hr/>
	1,781,846	337 miles and 2,486 feet.
Laid prior to 1861.....	87	" 585 "
<hr/>		<hr/>
Total to Dec. 31, 1877....	424	3,071

The average cost of pipes for the year was \$27.57 per ton. The quantities represented as being laid during the years 1875 and 1876 do not include larger pipes that were substituted for smaller ones, when an increased supply was required, and the smaller either taken up or abandoned.

#### FIRE HYDRANTS.

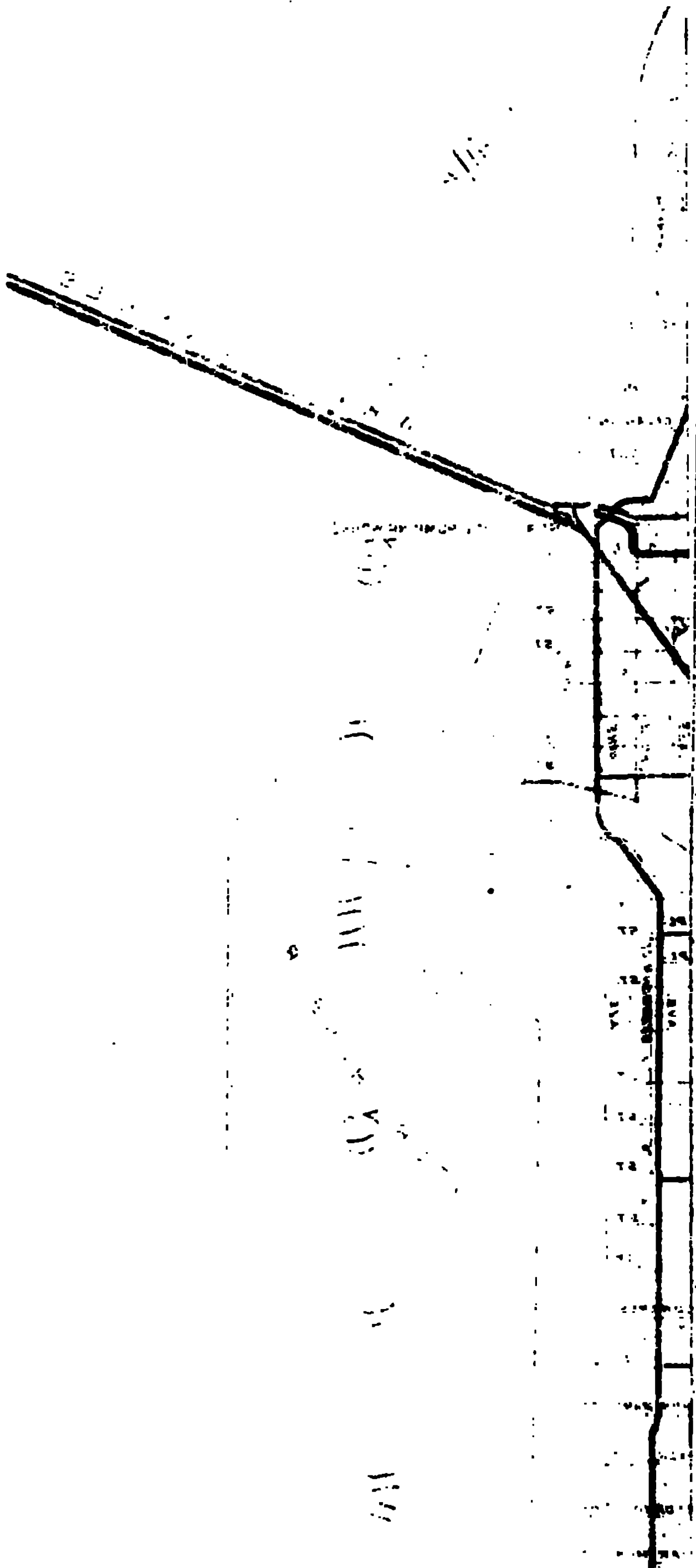
One hundred and one fire hydrants were added during the year:

North Division.....	18
South Division.....	14
West Division.....	69
	<hr/>
	101
Number reported last year.....	2,901
	<hr/>
Total December 31st, 1877.....	3,002

#### TAPPING AND WATER PIPES.

The following statement shows the number and size of taps used in making service pipe connections during the past year:

No. of $\frac{1}{2}$ inch taps inserted.....	1,054
No. of $\frac{5}{8}$ inch taps inserted.....	649
No. of $\frac{3}{4}$ inch taps inserted.....	68
No. of 1 inch taps inserted.....	53
	<hr/>
	1,824
Number in use December 31, 1876.....	57,130
	<hr/>
Total number in use December 31, 1877.....	59,369
No. of 4 inch service connections made.....	35
No. of 6 inch service connections made.....	16
No. of 8 inch service connections made.....	00



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## INCOME.

following table shows the total income of the Water from the time when the distribution of water commenced:

from January 15, 1854 to January 1, 1862.....	\$744,244.19
for fifteen months ending April 1, 1863....	189,294.80
for the year ending April 1, 1864.....	192,246.39
for the year ending April 1, 1865.....	224,902.57
for the year ending April 1, 1866.....	253,114.49
for the year ending April 1, 1867.....	302,017.59
for the year ending April 1, 1868.....	338,929.28
for the year ending April 1, 1869.....	420,686.94
for the year ending April 1, 1870.....	476,968.24
for the year ending April 1, 1871.....	539,180.19
for the year ending April 1, 1872.....	445,834.64
for the year ending April 1, 1873.....	544,465.90
for the year ending April 1, 1874.....	708,804.32
for the year ending April 1, 1875.....	705,926.64
for nine months ending Dec. 31, 1875.....	637,996.54
for the year ending Dec. 31, 1876.....	833,963.78
for the year ending Dec. 31, 1877.....	905,500.64
Total income to Dec. 31, 1877.....	<u>\$8,467,077.14</u>

## COST OF WATER WORKS.

Cost of water works to Dec. 31, 1877, including all work in progress.....\$8,344,350.08

## MEANS BY WHICH WORKS WERE PAID FOR.

loan bonds, 6 per cent., outstanding .....	\$ 921,000.00
loan bonds, 7 per cent., outstanding.....	3,660,000.00
loan bonds canceled.....	239,000.00
mill tax for 1871.....	289,746.47

One mill tax for 1872.....	284,197.43	
Appropriation for 1873.....	400,000.00	
Appropriation for 1874.....	533,705.14	
Appropriation for 1875.....	220,000 00	
Appropriation for 1876.....	391,865.19	
	<u>\$6,939,514.23</u>	
Less rebates on tax... ..	30,778 05	
	<u>\$6,908,736.18</u>	
From water rents.....	1,435,613.90	
	<u>\$8,344,350.08</u>	

## WATER RATES.

The water rent collections for the past year present a very encouraging and satisfactory result, leaving a credit to the water fund, after paying all running expenses, salaries, and interest on water bonds, a surplus of \$97,399.14.

The following table exhibits the amount of water furnished and the revenue received annually by the city, from the year 1858 to the present date:

YEAR.	Million gallons furnished.	REVENUE.	Revenue per million gallons.
1858.....	1,092	\$102,178 85	\$93 57
1859.....	1,415	122,753 50	86 70
1860.....	1,717	131,162 73	76 39
1861.....	1,767	131,035 10	74 15
1862 (fifteen months).....	2,705	188,448 25	85 00
1863.....	2,336	192,246 39	82 29
1864.....	2,523	224,902 57	89 14
1865.....	2,778	253,114 49	91 11
1866.....	3,169	302,017 59	95 30
1867.....	4,232	338,929 28	80 08
1868.....	5,375	420,686 94	78 26
1869.....	6,801	476,968 24	70 13
1870.....	7,945	539,180 19	67 86
1871.....	8,423	445,834 64	52 93
1872.....	10,051	544,465 90	54 17
1873 .....	11,723	708,804 32	60 46
1874.....	13,903	705,926 64	50 77
1875 (nine months).....	10,957	635,996 54	58 04
1876....	15,346	771,940 38	50 30
1877.....	19,047	908,509 64	47 70

## WATER METERS

The following table shows the number of meters added during the past year, together with those in use prior to that time:

SIZE OF METERS.	$\frac{3}{8}$	1	$1\frac{1}{2}$	2	3	4	Total.
Number in use Dec 31, 1876 .....	377	647	171	107	141	2	1448
Number of new meters added.....	112	52			18		177
Total number in use Dec. 31, 1877.....	489	699	171	107	154	2	1623

The quantity of water measured by meters during that time was:

North Division.....	208,465,000
South Division.....	1,156,600,000
West Division.....	564,472,500
Total.....	1,931,537,500

Number of water engines in use Dec. 31, 1876.....	84
Number added during the year .....	48

Total number in use Dec. 31, 1877.....132

The quantity of water used during the year is 225,374,500 gallons.

The amount collected for use of water measured by meters and water engines for the year is \$192,082.26.

## WATER RATES BY METER MEASUREMENTS.

The foregoing table indicates a rapid increase in the number of water meters placed in position during the past year, particularly of the size required for domestic use. This growing de-



mand is due entirely to the very low rate as now established, reducing the annual cost of water to domestic consumers (in comparison to the scale of assessment rates now in general use) fully two-thirds. It is quite evident, that an extended use of these meters under such circumstances would materially decrease the revenue and, perhaps, render the Water Department of the City no longer self sustaining.

To avoid such an evil, and to place all water takers in an equal and equitable position, an early readjustment of meter rates seems indispensable.

Very much can be said in favor of a general adoption of water meters, as their use has demonstrated that defective plumbing, causing leakage and a great waste of water, have been detected and corrected. In nearly every case where meters have been attached to the supply pipe, a general repair of the plumbing work of the building became necessary. This fact reveals one source of waste and suggests in a great degree its remedy.

The alarming yearly increase in the leakage and waste of water has reached such an extent, that it implies additional cost to the City for pumping, and if not remedied, will shortly necessitate a large additional outlay for engines and machinery, in order to supply the demand under an emergency. In view, therefore, of the benefits the City would derive from the general use of such meters, it would be wise to fix the rates sufficiently below the annual cost of water to consumers under the usual assessment plan, to encourage rather than to discourage their use.

In establishing such rates it would be just to discriminate between consumers of large and small amounts of water, and thus a graduating scale of rates from an annual consumption of one million gallons to the largest quantity used, would be equitable. In no event could the City reasonably adopt any meas-

ure, which would diminish in any way its revenue from this Department. A decrease in the rates could only be justifiable in the adoption of some method or device, that would substantially and proportionately check the waste of water and save to the City an estimated annual expense of \$50,000. This result can be largely attained by a general use of water meters, or the unanimous and faithful co-operation of the public in the economical use of water and the speedy and thorough repair of defective plumbing.

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### LAKE TUNNEL CRIB.

This structure which protects the entrance into the lake tunnels of the water supply for the City has from the beginning been a source of anxiety, and many thousands of dollars have been spent to avoid the evil consequences, that might have resulted from serious injury to it. No interception of the supply, however, has ever yet occurred, or been threatened, except by ice. This has occasionally caused inconvenience and great anxiety to the officials in charge, but has never lasted long enough to alarm the citizens, or even be suspected by them, till all immediate danger was passed. To guard as far as possible against this danger, the crib keeper has been allowed an assistant during the winter, and some times two, during very cold weather. Besides this, a tug is kept all winter long, near the mouth of the river, ready to start on very short notice for the crib with whatever might be needed. Telegraphic communication has been kept up ever since the completion of the new lake tunnel.

Soon after the completion of the present stone superstructure on the original wooden foundations, cracks in the outer walls,

and a settling of the floor near the living room appeared. These however, did not cause much anxiety, although the latter at times let in water to an annoying extent. Occasional storms broke in the windows and flooded the keepers apartment, in consequence of which the late Board of Public Works built for him the brick house on top of the crib, where he is dry and comfortable.

While the question of repairing the injuries just mentioned had been under discussion and was put off mainly on account of the funds being more needed in completing the west side pumping works the public mind became greatly excited by articles which appeared in the Daily Tribune, representing the crib as being in danger of early destruction from the violence of storms and the City as liable to be deprived of its water supply. In consequence of these grave apprehensions, an examination of the structure was made by the Finance Committee under the immediate direction of General Wm. Sooy Smith, whose report is also submitted. The effect of this report was to allay all apprehensions of immediate danger of the destruction of the crib. Since then the masonry has been repaired, angle irons put on to protect the corners of the wood work under water from ice, and wedges driven into a large portion of the spaces found between the bottom of the stone work, and the timbers of the crib.

While this was going on, in October last, it was discovered, that one side of the crib had bulged at its centre about three inches, and the centers of the others two inches or less. It could not be determined, when this took place, or whether it would increase, but, to prevent further movements, directions were given to stay the crib by means of steel rods extending through the wood work from the inside or well to the outside. The details of this work will be found in the report of the City Engineer.

The cost of this work might have been avoided for a year or two, or perhaps altogether, but under all the circumstances it was thought best to run no risks whatever, in so vital a matter as the city's supply of water.

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### SEWERAGE.

There were constructed during the past year 64,666 lineal feet, or  $12\frac{1}{4}$  miles, of sewer, at a cost of \$117,879.85. There remains to be constructed, on contracts already awarded, 8,860 lineal feet, the cost of which is estimated at \$18,000, making the sewerage of the city, now completed, equal to 278 miles.

It is hardly necessary to add anything to what has been expressed in previous reports in relation to the importance of a continued, wise and judicious prosecution of this work; entering as it does into nearly every comfort and convenience of domestic life, and affecting vitally the sanitary condition of the city.

It is desirable that in the erection of buildings a more thorough system of constructing private or house drains should be pursued. The evil, and often fatal, effects of poisonous gases escaping into buildings through improperly constructed drains are well known, and can be remedied by using in their construction suitable material, the proper application of drain traps and well-arranged ventilation.

With these appliances arranged and perfected under the supervision of honest and skillful labor, our homes and places of business will be permanently free from this offensive and dangerous poison.

The following statement will show the amount of sewers constructed during the past year in the different divisions of the city, together with the diameter of the same :

North Division.....	14,060 feet
South Division.....	15,711 "
West Division.....	34,895 "
Total.....	<u>64,666 feet</u>

23,775 lineal feet.....	1	ft. diameter
3,281 " ".....	1 $\frac{1}{4}$	"
25,130 " ".....	2	"
993 " ".....	2 $\frac{1}{2}$	"
2,767 " ".....	3	"
1,323 " ".....	3 $\frac{1}{2}$	"
3,885 " ".....	4	"
2,216 " ".....	4 $\frac{1}{2}$	"
320 " ".....	5	"
976 " ".....	6 $\frac{1}{2}$	"

64,666 lineal feet total laid during the year.

Amount laid previous to December 31, 1876, 1,403,463 lineal feet, making a total of 1,468,129 lineal feet, or 278 miles 289 feet, laid to December 31, 1877.

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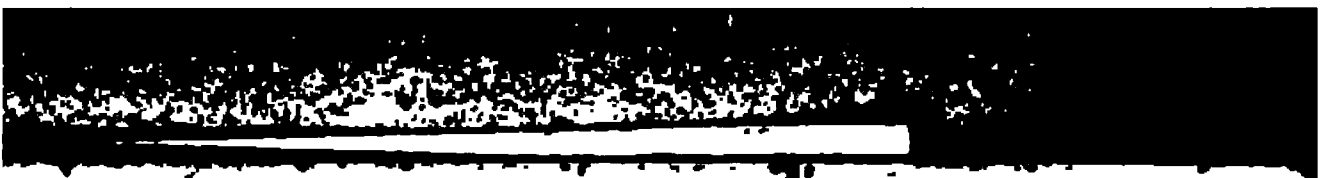
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WEEK TO YEAR

CHARTER

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CHARTERED

1. JANUARY 1, 1978.

EXPLANATIONS

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The following table indicates the total amount of sewerage constructed annually, together with the cost of the same since 1861:

DATE.	No. of Feet of Sewers Laid.	No. of Catch Basins Cons'd.	No. of Man- holes Cons'd.	No. of Private Drains Laid.	Cost of cleaning Sewers and Catch Basins.	Total cost of constructing Sewers.
1861 May 6	283,586	1,174	2,102	2,194	\$ 5,619.48	\$665,188.46
1862 Jan. 1	2,826	18	33	243	5,474.03	3,617.81
1863 Apr. 1	15,676	72	66	365	4,793.35	57,264.51
1864 " 1	39,605	232	204	536	5,123.39	169,299.29
1865 " 1	25,021	188	183	512	9,364.68	87,221.48
1866 " 1	29,948	223	168	1,288	13,818.07	137,643.02
1867 " 1	48,127	327	271	3,722	28,445 16	225,564.53
1868 " 1	89,661	418	555	3,703	26,540.81	416,730.51
1869 " 1	47,841	480	293	3,261	26,954.06	197,152.92
1870 " 1	139,705	771	928	3,979	26,015.18	654,141.26
1871 " 1	78,166	626	468	5,187	21,464.30	258,664.70
1872 " 1	50,716	277	300	3,093	17,415.46	153,295.36
1873 " 1	47,342	245	341	1,435	21,484 16	173,255.76
1874 " 1	146,702	897	1,015	4,691	31,229.27	506,283.45
1875 " 1	222,322	1,054	1,474	6,292	37,034.82	587,507.38
1876 Jan. 1	120,971	958	789	3,365	32,098.23	342,932.89
1877 " 1	.....	.....	.....	.....	39,345.41	83,215.17
1878 " 1	64,666	363	431	1,822	35,729.33	117,879.85

#### REPAIRS.

The cost of repairing sewers and catch-basins, and of removing and repairing man-holes and their covers, has been for the year \$9,778.97.

#### PRIVATE DRAINS.

The number of private drains connected with the public sewers are as follows:

North Division.....	445
South Division.....	561
West Division.....	816
Total.....	1,822

The receipts for the year for private drain permits have been \$9,760.25.



SECOND ANNUAL REPORT OF

COMMISSIONER

OF THE  
LAND OFFICE

OF THE TERRITORY OF ARIZONA

EXPLANATIONS

ALL PLACES OR PLACES IN WHICH THE

LAND OFFICE HAS BEEN

INDICATE THE DIRECTION OF THE CURRENT

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## SEWERAGE EXPENSE, REPAIRS AND INTEREST.

Salaries, office and miscellaneous expenses.....	\$ 6,329.66
Repairs, North Division.....	2,874.59
“ South Division.....	2,975.18
“ West Division.....	3,925.43
Cleaning, North Division.....	8,729.07
“ South Division.....	11,759.30
“ West Division.....	15,274.96
Street intersections.....	6,184.24
Interest.....	386,041.91
Sinking Fund.....	1,000.00
	<u>\$445,094.34</u>
Less interest paid on River Improvement Bonds...	183,915.46
	<u>\$261,178.88</u>

## SEWERAGE LOAN BONDS.

Six per cent. bonds outstanding Dec. 31, 1877....	\$ 87,000.00
Seven per cent. bonds outstanding Dec. 31, 1877..	2,550,000.00
Total.....	<u>\$2,637,000.00</u>

## SEWERAGE SINKING FUND.

Amount of money in the hands of the City Treasurer, Dec. 31, 1877. not applied to canceling bonds.....	\$55,588.16
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## STREETS.

There were at the close of the past year one hundred and thirty-two miles of streets improved in various forms of pavement, a great proportion of which is laid with wooden blocks, eight and three-fifths miles having been paved during the past year.

Many of the paved streets are, by reason of decayed and worn out blocks, in a condition requiring immediate repaving, being beyond the possibility of repair; a very large amount of money must necessarily be expended to place them in a passable and satisfactory condition. In anticipation of this great outlay much attention has been bestowed upon the subject, as to the most approved method of street paving; after considering nearly every conceivable device, either from practical experiments or the experience of other cities, there seems to have been no conclusions reached, which would lead to the adoption of a pavement, that would answer all the requirements of a perfect and satisfactory improvement. With the water, sewer, and gas mains, together with their private connections located in our public streets, it requires more than an ordinary degree of care and effort to so prepare the foundations as to prevent the formation of holes or an uneven surface after the pavement is completed. The frequency with which our streets are disturbed for the purpose of laying or repairing our water pipes or drain connections almost precludes the possibility of preserving our street pavements in a perfect, unbroken condition, because, when once disturbed, for causes above mentioned, it can not be replaced in a perfect and satisfactory manner and must necessarily admit the drainage of the streets, undermining the foundation and affecting more or less the surrounding pavement. The practice heretofore pursued (particularly in streets improved under private contract) of laying the underground work and filling the streets to grade only a few days in advance of laying the pavement, is sufficiently impracticable and absurd to require any comment. The recent passage of ordinances providing a more definite system of improving our streets, requiring all the underground work to be completed and a more thorough and substantial foundation prepared to receive the pavement, will aid much in securing a more desirable and lasting improvement.

## THE RIVER.

The expenditure of \$1,300 for adding some two feet to the height of the dam across the entrance to the Ogden and Wentworth Canal has proved successful in preventing the waters of the Desplaines from flowing into the Chicago River, and in turning the current of the South Branch into the Illinois and Michigan Canal, thereby greatly perfecting the drainage of that portion of the city south of the main river, and rendering the waters of the South Branch comparatively odorless and free from offensive impurities.

No dredging of importance has been done in the river during the past year: the continued high water in lake and river has obviated the necessity for this work and saved the expense to the city.

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## FULLERTON AVENUE CONDUIT.

The work of constructing the Fullerton Avenue conduit having been completed, there remains only the application of pumping machinery, to render the improvement effective in cleansing the north branch of the river. It is to be hoped that the finances of the city will admit of using the amount appropriated for the final completion of this important work, and thus accomplish a most desirable enterprise in replacing with pure and healthful water the present filthy and offensive condition of the river.

The contracts under which the work has been thus far constructed, are as follows: On the 28th day of March, 1874, a contract was entered into with Messrs. Geo. F. Norris & Co. and the work prosecuted until the 8th day of December

following, and on the 14th day of June, 1875, when, by an order of the Council, the contractors were released from their contract, the price being insufficient to complete the work.

There had then been completed 4,192 lineal feet of

conduit at a cost of.....	\$117,948.81
Extra amount allowed by order of Council.....	38,684.34

On the 13th day of September a contract was entered into with Messrs. Fitzsimmons and Connel to complete the unfinished portion of the work, being 7,536 lineal feet of conduit costing..... 320,659.53  
which includes the lake shore shaft and the outlet shaft, pier and house.

For engineering, superintending and miscellaneous expenses for the whole work.....	27,261.64
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Making the total cost of conduit built, a distance of 11,728 feet.....	\$504,554.32
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For the purchase of land, the erection of the engine house, engine and pumping machinery, with river connections, etc., the estimated cost is.....	75,600
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Making the whole, when completed for use,	\$580,154.32
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## VIADUCTS.

There are now erected, in connection with the river bridges, sixteen viaducts, spanning the tracks of the various railroads entering the city, two of which are constructed of wood and fourteen of iron, costing in the aggregate \$615,339.55.

The completion of the Milwaukee avenue and Desplaines street viaduct the past year, and the opening of the same to public use and travel on the 25th day of May, are events of no small importance, affording as they do a direct and unobstructed thoroughfare between a thickly-settled residence and business section of the northwest and the central business portion of the city, at the same time permitting the more rapid movement of trains without endangering life and property, thus greatly facilitating the general business and commercial interests of the city.

This viaduct is much the largest and most expensive of any in the city, costing for the construction and erection of the sub and super-structure, \$140,371.55, and in point of mechanical engineering, skill and workmanship, ranks among the first structures in the city.

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## BRIDGES.

There are now built in the city thirty-two draw or pivot bridges, crossing the river at various points, of which eleven are constructed of iron, nineteen of iron and wood, known as combination, and two wholly of wood. In connection with the usual amount annually expended in the maintenance of these structures, there have been erected during the past year four new bridges, contracted for as follows: For constructing a combination, draw or pivot bridge, with abutments and approach across the South Branch at Fuller street, a contract was entered into with G. W. James, dated May 5th, the work to be completed August 8, 1877, at a cost of \$4,210.00.

On the 22d day of June, a contract was entered into with B. Howard, to erect a combination draw bridge over the

Branch at Halsted street, to be completed September 1, 1877, at a total expense of \$4,190.00.

The contract for constructing a combination swing bridge across the North Branch at North avenue, was awarded to Messrs. Conro, Carkin & Co., for the sum of \$7,149, to be completed in the month of December, 1877.

The iron draw bridge, with the abutments and approaches, at Harrison street, constructed by the American Bridge Company under contract dated June 22d, 1875, was completed and closed for public travel October 23d, 1877, the whole structure costing \$24,875.00. In addition to this cost, the damages for land necessary to be taken, for widening the river at this point, to admit of a navigable channel on each side of the center protection, was fixed by the Court at \$14,094.66. In connection with the amount thus paid the City entered into contract with Messrs. Conro, Carkin & Co., to dredge and dock the property condemned at this point, for the sum of \$2,878.85, making the total expense of the whole work, including land damages, \$41,848.51, being less than half the amount of the original estimate.

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## PUBLIC BUILDINGS.

There have been erected, during the past year, bell and watch towers to each of the engine houses located at No. 237 West Chicago avenue and at No. 80 West Lake street, at an expense of \$1,760.00 each.

At a regular meeting of the City Council, held September 3d, 1877, steps were taken looking to the immediate commence-



ment of the construction of the new City Hall, in the passage of the following

ORDINANCE.

*Be it ordained by the City Council of the City of Chicago :*

“SECTION 1. That the Department of Public Works, in connection with the Building Committee of this Council, be and they are hereby authorized and empowered to take immediate measures to put in the foundations of the City Hall building upon its original site, and according to such plans and specifications, and in such manner as they, or a majority of them, may decide upon, and to employ such help and let such contracts in carrying on said work as may seem proper and advisable, as provided by law.”

“SEC. 2. This ordinance shall take effect and be in force from and after its passage.”

On the 6th day of September, 1877, the Mayor, in charge of the Department of Public Works and the Building Committee of the City Council, consisting of Aldermen John M. Van Osdel, Addison Ballard, A. B. Cook, Frank Linsenbarth and Frank Lawler, met for the purpose to organize and transact business relating to the construction of the new City Hall, in accordance with the power vested in them by the passage of the above ordinance.

An agreement having been entered into between the County and the City requiring the exterior portion of the Court House and the City Hall to be of an uniform architectural design, negotiations were entered into with James J. Egan, Esq., Architect for the County, to furnish the City duplicate drawings of the front elevations, together with plans in detail of the stonework of the Court House, such drawings to be used in the construction of the City's portion of the building.

L. D. Cleaveland, Esq., Superintendent of Buildings, was placed in charge of construction and of preparing plans and drawings for the interior portion of the City Hall. These drawings are nearly completed, and show an arrangement well-calculated to accommodate the wants of the various offices of the City Government, with spacious, well-lighted and well-ventilated apartments, and a finish tasteful and appropriate.

Plans and specifications having been prepared, proposals were invited for excavating for foundations and for constructing the sub-basement, resulting in awarding the contract for excavating to John Sackley, Esq., and for building the sub-basement to Messrs. Mortimer & Tapper, the contract requiring the whole work to be completed May 1, 1878. At the close of the year the foundations were one-third completed and, with favorable weather, it is presumed the work will be fully completed at the time agreed upon.

The drawings for the elevations are so far advanced as to admit of advertising for proposals for furnishing stone, masonry and iron work without much delay; or, at least, all details will be in readiness as soon as the foundations are prepared to receive the main walls of the structure.

The management thus far, in the construction of the City Hall, indicates a skill, efficiency and honesty which, if carried out to its final completion, will place the City in possession of a structure elegant in design and finish, convenient in arrangement and substantial in its construction, at a cost much below former estimates, and which could hardly be less expensive if erected under private enterprise.

## PARKS.

No improvements have been added to the Parks under control of this Department, during the past year, there being only a sufficient amount appropriated and expended to preserve in good condition the lawns, walks and ornamental fixtures already constructed and arranged in the various public parks.

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## SPECIAL ASSESSMENTS.

The method of contracting for the improvements of streets does not differ from that of previous years. A large proportion of street paving has been done under private contract, with the owners of property abutting on the street to be improved, in place of levying a special assessment by the city upon the property benefitted, and contracting the work to the lowest responsible bidder.

In permitting our streets to be improved under private contract, the City must meet with much inconvenience and annoyance, if not actual loss, and would still urge upon the public, as in previous reports, the importance of improving streets under special assessment, receiving under this form the benefit of competition in prices for the work, which in nearly every case reduces the cost of the improvement greatly below prices procured under private contract.

It is believed that a strict enforcement of the general order of the City Council, requiring the contractor to procure the signatures of property owners, representing seven-eighths of the number of feet fronting on any such street to be improved, places at this time a form of restriction upon the system of street work which will, doubtless, decrease the amount of improvement usually completed under this form of contract.

## · SIDEWALKS.

There has been constructed during the past year nearly thirty-one miles of new sidewalk, making, in connection with walks previously built, a total of about seven hundred and four miles of sidewalk laid in the City.

## EXPENDITURES.

The following is a condensed statement of the amount expended from various funds for the construction and maintenance of public works under the control of this Department during the past year.

## WATER FUND.

Water-pipe extension.. . . . .	\$90,511.43
New Engines.. . . . .	63,905.68
New Pumping Works.. . . . .	10,774.38
North Side Pumping Works.. . . . .	91,798.10
West Side Pumping Works.. . . . .	54,376.59
Office expenses and salaries. . . . .	29,997.56
Water Meters.. . . . .	16,315.90
Repair of pipes, hydrants and miscellaneous operating expenses, including twenty-two bonds purchased and cancelled.. . . . .	87,148.00
Lake Tunnel Crib.. . . . .	18,952.97
Water loan interest.. . . . .	335,703.41
Water service cocks.. . . . .	1,777.78
Income refunded.. . . . .	102.98
Paid to sundry parties for money advanced to lay water pipes.. . . . .	9,736.72
	<hr/>
	\$811,101.50

## SEWERAGE FUND.

Office expense and salaries.....	\$6,329.66
Repairs, sewers in North Division.....	2,874.59
Repairs, sewers in South Division.....	2,975.18
Repairs, sewers in West Division.....	3,925.43
Cleaning sewers in North Division.....	8,729.07
Cleaning sewers in South Division.....	11,759.30
Cleaning sewers in West Division.....	15,274.96
Stock account.....	150.44
Street intersections.....	6,184.24
Sewerage sinking fund.....	1,000 00
Sewerage loan interest.....	386,041.91
	<hr/>
	\$445,244.78

## SEWERAGE CONSTRUCTION ACCOUNT.

Covers account.....	\$3,572.54
Cement account.....	128 75
Ward 4.....	3,392.40
“ 5.....	22,216.67
“ 6.....	18,995.32
“ 7.....	2,286.24
“ 8.....	1,511.22
“ 11... ..	1,196.03
“ 12.....	12,874.82
“ 13.....	12,586.25
“ 14.....	13,763.72
“ 15.....	28,802.06
“ 16. ....	2,910 11
“ 17.....	1,888.13
Paid sundry persons for money advanced to build sewers.....	1,957.14
	<hr/>
	\$129,081.40

## APPROPRIATION FUND.

North Division. . . . .	\$28,514.99
South Division. . . . .	59,753.73
West Division. . . . .	80,624.49
Sidewalks, North Division. . . . .	2,000.00
"    South Division. . . . .	3,000.00
"    West Division. . . . .	5,000.00
Office expense and salaries. . . . .	9,600.60
City Hall Building. . . . .	9,094.01
Washington Park. . . . .	2,541.10
Ellis Park. . . . .	1,115.07
Lake Park. . . . .	5,201.78
Union Park. . . . .	2,459.97
Jefferson Park. . . . .	1,098.11
Vernon Park. . . . .	1,476.39
Wicker Park. . . . .	1,093.88
Washington Street Tunnel. . . . .	6,718.12
LaSalle Street Tunnel. . . . .	2,123.33
Street signs. . . . .	9.90
Public hydrants. . . . .	306.44
Public benefits. . . . .	88,771.47
Street lamps. . . . .	6,559.31
Chicago harbor. . . . .	3,364.43
Land damages at Harrison Street Bridge. . . . .	15,155.57
Land damages at C. & A R. R. bridge. . . . .	5,000.00
Bridge tenders salaries. . . . .	37,171.25
Bridge Department. . . . .	20,066.99
Harrison Street Bridge. . . . .	7,566.25
North Avenue Bridge. . . . .	4,250.00
Fuller Street Bridge. . . . .	4,210.00
North Halsted Street Bridge. . . . .	4,190.00
Blue Island Avenue Viaduct. . . . .	7,834.10
Milwaukee Avenue Viaduct. . . . .	78,621.50

Permits .....	838.31
Fullerton Avenue Conduit .....	62,098.81
Interest on Revenue Warrants.....	48,733.00
Ogden Ditch Dam.....	1,300.00
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	8617.45294

### CONCLUSION.

The construction and maintenance of the various public improvements under the immediate control and supervision of this Department being to a greater or less extent identified with the general welfare and prosperity of the City, there can be no doubt as to the necessity of a wise and judicious expenditure of the money appropriated annually for the support of this branch of the City Government.

There has been during the past year no attempt to force upon the people the expense of any public improvement, which was not demanded by public necessity, and in every case where such improvements have been ordered has the work been executed and materials furnished at a cost which the closest competition could secure.

It is to be regretted, however, that a thorough and extended improvement of our streets could not be immediately commenced, but on account of the extent of the work and the amount of money required in its completion, neither the City Government nor the citizens are prepared to meet the necessary outlay. The Department, therefore, can only perform such street work as is provided for by a limited appropriation,

A reduction of fifteen per cent. in the amount of salaries has been made in this Department, so as to conform to the amount appropriated for this purpose, in anticipation of a shrinkage in the collection of City taxes equal to this amount. The same principle has been enforced in all cases where public improvements have been made under contract, or otherwise ordered, and relying for payment for the same on appropriations, which are supplied with funds from the collection of City taxes.

In the reduction above referred to the Department has suffered no loss in the efficiency or skill in the management of its various branches, there having been no change in the heads of departments, to whose reports you are respectfully referred for information in detail.

MONROE HEATH, *Mayor.*





# CITY ENGINEER'S REPORT.

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CHICAGO, APRIL 30TH, 1878

*Hon. Monroe Heath, Mayor:*

SIR :—In presenting his report for the year ending December 31, 1877, the City Engineer follows the usual order, and submits first the operations of the pumping works.

## REPORT OF THE ENGINEER OF THE PUMPING WORKS.

NORTH PUMPING WORKS, }  
CHICAGO, APRIL 2, 1878. }

E. S. CHESBROUGH, Esq., *City Engineer.*

SIR:—The twenty-fifth annual report of the operations of these works, being for the year ending December 31st, 1877, is herewith submitted.

The total quantity of water pumped as shown by the records is 11,958,977.636 gallons.

The daily average quantity pumped during 1876, was nearly  $39\frac{3}{4}$  million gallons.

The daily average for the past year is a little over  $32\frac{3}{4}$  million gallons.

The greatest daily average for a single month was during last May, being nearly  $37\frac{1}{4}$  million gallons.

The exact quantities are given in the various tables, and are exclusive of the quantities pumped by the "West Works."

The following tabulated record shows in detail the operations of the engines and boilers during the past year.

# OPERATIONS OF ENGINES AND BOILERS.

MONTHS. 1877	No. of Days.	No. of hours run per Month.	Av. No. of hours run per day.	Total Revolu- tions per Month.	Av. No. of Revolu- tions per day.	Total No. of Gallons of water pumped per Month less 6 per cent. allowed for loss of action.	Av. No. of wa- ter pumped per day less 6 per cent. allow- ed for loss of action.	Pounds of coal con- sumed per Month for Pumping.	Av. No. of pounds of coal con- sumed pr day for Pumping	Pounds of coal con- sumed per month for changing Boilers	Total lbs. of coal con- sumed per Month.
January .....	31	H. M. 744:00	H. M. 24:00	854,114	27,552	719,462,385	23,208,464	1,633,790	52,702	6,400	1,640,190
February.....	28	672:00	24:00	593,693	21,203	774,594,448	27,664,088	1,626,520	58,090	7,800	1,634,320
March .....	31	744:00	24:00	436,789	14,090	1,088,521,780	35,113,606	2,231,540	71,985	2,400	2,233,940
April .....	30	720:00	24:00	525,618	17,520	1,109,005,815	36,966,960	2,153,010	71,762	8,500	2,161,510
May.....	31	744:00	24:00	598,407	19,303	1,154,372,813	37,237,833	2,358,530	76,081	5,200	2,363,780
June.....	30	720:00	24:00	583,587	19,452	1,110,876,865	37,029,229	2,111,960	70,398	4,400	2,116,360
July .....	31	744:00	24:00	587,485	18,951	1,115,239,814	35,975,478	2,058,590	66,406	4,400	2,062,990
August.....	31	744:00	24:00	552,661	17,827	1,066,176,419	34,392,788	1,910,450	61,627	4,600	1,915,050
September.....	30	720:00	24:00	509,544	16,984	1,012,628,066	33,754,269	1,743,230	58,107	4,000	1,747,230
October .....	31	744:00	24:00	501,135	16,165	998,713,776	32,216,573	1,685,930	54,385	4,000	1,689,930
November.....	30	719:45	23:59½	444,701	14,823	909,774,581	30,325,819	1,536,240	51,208	2,700	1,538,940
December. ....	31	744:00	24:00	436,010	14,065	899,607,884	29,019,609	1,471,280	47,478	5,160	1,476,980
Totals.....	365	8,759:45	.....	6,623,744	.....	11,958,977,636	.....	22,521,610	.....	59,560	22,581,170
General average per Month.	.....	729:58	.....	561,978	.....	996,581,470	.....	1,876,800	.....	4,963	1,881,764
General average per Day....	.....	.....	23:59 9-10	.....	18,147	.....	32,764,323	.....	61,703	163	61,866

NOTE.—Coal for heating building, etc. included in above amount

## CONNECTION WITH THE WEST PUMPING WORKS.

Although the preceding and following tabular statements show only the operations of these works, it is difficult to give a satisfactory statement of all our doings without mentioning those of the West pumping works, which cannot be operated except in the closest harmony with these, for the least change there is immediately felt here, and *vice versa*.

The pumping capacity at both stations consist of eight distinct engines. Four of them are independent and two are double-coupled together.

The aggregated nominal daily capacity of all the engines is about one hundred million gallons.

During the past year, through the hours of greatest consumption of water, six of the largest of the eight engines have been kept in operation at a moderate rate of speed, viz: the two independent engines at the west works, and the two double engines at the north works.

At different times in the early evening three of these engines are stopped, viz: one at the west works and two at the north works, so that during the advanced hours of the night, and until daylight, only about two-thirds of the daily capacity is kept in operation. Of course a portion of the pumping machinery has been in operation, constantly. The total running time for the year being 8,759 45-60 hours, or within a slight fraction of 24 hours per day.

The total quantity of water pumped, and the time run by the several engines respectively, are set forth in the annexed tables:

ENGINES DESIGNATED AS	HOURS AND MINUTES.	TOTAL REVOLUTIONS.	Total Gallons Water Pumped less 6 per ct. for loss of action.
1853.....	H. M. 219 57	138,706	67,648,032
1857.....	563 20	344,972	264,607,323
1867.....	3,755 29	2,378,186	2,251,746,886
1872.....	7,605 45	3,761,880	9,374,980,395
Totals.....	12,144 31	6,623,744	11,958,977,636

## FUEL.

Coal has been received and used as follows:

	TONS.	POUNDS.
On hand January 1, 1877.....	246	870
Received of Midway.....	20	
"    Minonk.....	44	1,220
"    Erie.....	1,728	1,480
"    Lackawanna.....	9,763	1,900
	TONS.	POUNDS.
Used for pumping, heating building Lake Basin, etc....	11,306	400
Used for work-shop, and pipe extension.....	201	1,070
On hand January 1, 1878.....	296	
Total.....	11,803	1,470
	11,803	1,470

## EXPENSES DUE TO PUMPING.

Salaries of engineers.....	\$6,765.00
Labor, firemen, etc.....	12,522.45
11,260 $\frac{1}{2}$ $\frac{61}{100}$ tons of coal at an average cost of \$5.38 $\frac{1}{4}$ per ton.....	60,611.32
494 $\frac{1}{2}$ gallons lard oil.....	423.54

343 gallons cylinder oil.....	324.27
33 pounds of lubricating compound.....	13.20
108 pounds of tallow.....	10.80
1,289 pounds of waste.....	119.77
285 pounds of packing.....	179.17
Small stores.....	106.55
Gas for lighting works.....	1,167 27
Repairs of boiler room tools.....	66.74
Repairs of engines.....	2,057.24
Repairs of boilers.....	498.58
Total.....	<u>\$84,865.90</u>

Cost of delivering water per million gallons.....	\$7.09 <sup>64</sup> / <sub>100</sub>
Cost of repairs per million gallons.....	22 <sup>87</sup> / <sub>100</sub>

## DISTRIBUTED AS FOLLOWS:

To engines.....	18 <sup>70</sup> / <sub>100</sub>
To boilers.....	04 <sup>17</sup> / <sub>100</sub>
Subdivided as follows:—	
Extraordinary repairs of engines.....	08 <sup>72</sup> / <sub>100</sub>
Ordinary repairs of engines.....	09 <sup>98</sup> / <sub>100</sub>
Repairs of boilers.....	04 <sup>17</sup> / <sub>100</sub>

The following is the cost of delivering water per million gallons during the past ten years, and cost of coal:

	Average cost of coal per ton.	Cost per million gallons.
1869.....	\$7.60	\$12.45
1870.....	6.93	11.71
1871.....	6.49	11.31
1872.....	8.09	12.02
1873.....	7.18	11.64
1874.....	8.56	12.86

	Average cost of coal per ton.	Cost per million gallons
1874-5 .....	8.27	12.26
1875 (nine months only).....	7.93	10.81
1876.....	7.15	9.56
1877.....	5.38	7.09
	<hr/>	<hr/>
Average for ten years.....	\$7.35	\$11.17

The quantity pumped each month for the past ten years is as follows:



TABLE SHOWING QUANTITY OF WATER PUMPED AT THE "NORTH PUMPING WORKS" EACH MONTH DURING PAST TEN YEARS.

MONTH.	1869-70	1870-71	1871-72	1872-73	1873-74.	1874-75.	1875.	MONTH	1876.	1877
April . .	370,430,083	516,568,836	561,266,363	696,411,300	916,329,315	909,283,640	1,243,837,877	January.	1,298,668,503	719,462,385
May . . . .	462,382,533	511,024,720	628,128,473	758,320,486	951,923,086	1,044,116,222	1,250,003,053	February	1,180,388,859	774,594,448
June . .	422,000,652	537,626,771	739,501,033	749,938,470	936,614,148	1,010,002,623	1,163,965,566	March . .	1,244,271,298	1,088,521,780
July . . .	505,513,484	641,359,423	709,072,064	876,296,381	1,000,692,844	1,297,543,064	1,239,434,124	April . .	1,199,626,500	1,109,008,615
August .	492,160,940	626,549,674	797,067,274	852,076,314	1,030,164,846	1,322,540,047	1,273,876,026	May . .	1,306,577,131	1,154,372,813
September	447,210,481	582,379,272	751,256,806	842,698,858	973,690,325	1,246,342,004	1,190,570,888	June . .	1,237,317,437	1,116,876,866
October	456,278,767	559,909,968	694,066,940	843,791,299	1,019,333,312	1,151,106,736	1,227,868,188	July . . .	1,358,702,900	1,116,239,814
November	430,387,264	550,754,750	850,030,082	833,879,447	1,025,633,854	1,068,221,956	1,160,694,177	August	1,376,693,544	1,060,176,419
December	469,284,041	569,074,119	558,173,911	877,680,081	1,026,230,398	1,140,266,746	1,192,690,258	September.	1,244,746,800	1,012,628,066
January	457,364,543	548,247,452	602,621,440	905,391,154	1,055,646,383	1,193,462,450	1,132,462,490	October.	1,268,071,044	988,713,776
February	418,212,250	525,713,115	547,673,127	838,244,79	984,813,302	1,136,985,231	1,130,065,231	November	1,012,851,277	909,774,681
March	508,148,234	625,948,628	616,604,794	978,065,177	1,002,941,559	1,353,230,536	1,365,239,539	December.	869,709,283	890,007,844
Totals	5,374,024,577	6,801,340,720	7,944,684,840	10,050,660,189	11,722,819,022	13,903,197,493	14,642,620,293	Total	14,525,858,708	11,368,977,646

\*These three months' figures were borrowed from the previous year (the commencement of the municipal year having been changed); in order to make up twelve months' work. They exceed the actual quantity pumped by 63,338,837 gallons, but it being leap-year, there were twenty-nine days in February, besides which the new pumping works were in operation

TABLE SHOWING TOTAL QUANTITY OF WATER PUMPED AT THE NORTH PUMPING WORKS,  
TOGETHER WITH ANNUAL AND DAILY INCREASE IN QUANTITY AND RATE PER CENT.

ALSO, THE GREATEST DAILY AVERAGE FOR A SINGLE MONTH, FOR THE FOLLOWING YEARS.

YEAR.		Total Quantity Pumped.	Annual Increase.	Average Daily Quantity Pumped	Average Daily Increase.	Per Cent. of Annual Increase.	Greatest Daily Average.	
ENDING.		GALLONS.	GALLONS.	GALLONS.	GALLONS.		MONTH.	GALLONS.
Dec. 31...	1858.....	1,091,865,459	.....	2,991,413	.....	.....	September.....	3,617,818
" 31...	1859.....	1,415,147,910	323,282,453	3,877,119	885,706	29.60	October.....	4,565,388
" 31...	1860...	1,716,786,552	301,338,642	4,703,525	826,406	21.29	July.....	5,367,569
" 31...	1861.....	1,767,154,689	50,368,137	4,841,520	137,995	2.93	August.....	5,438,790
Mar. 31...	1862.....	2,217,279,739	450,125,050	6,074,739	1,233,219	25.47	July.....	6,748,899
" 31...	1863.....	2,336,108,454	118,128,715	6,400,298	325,559	5.32	January.....	6,770,483
" 31...	1864.....	2,523,339,218	187,230,764	6,913,259	512,961	8.01	August.....	8,293,850
" 31...	1865.....	2,777,817,349	254,478,131	7,610,459	697,200	10.08	September.....	8,871,530
" 31...	1866.....	3,168,769,609	390,943,260	8,681,536	1,071,077	14.07	July.....	10,022,164
" 31...	1867.....	4,231,791,659	1,063,031,050	11,562,273	2,880,737	33.54	March.....	12,455,113
" 31...	1868.....	5,374,624,576	1,142,832,917	14,724,999	3,162,726	27.00	March.....	16,414,460
" 31...	1869.....	6,801,146,720	1,426,522,144	18,633,278	3,908,279	26.54	July.....	20,649,014
" 31...	1870.....	7,944,684,840	1,143,538,120	21,766,260	3,133,082	16.81	August.....	25,712,589
" 31...	1871.....	8,423,890,966	479,206,486	23,464,877	1,698,617	6.03	August.....	28,000,000
" 31...	1872.....	10,050,939,189	1,627,048,223	27,536,819	4,071,942	19.31	March.....	31,485,670
" 31...	1873.....	11,722,819,032	1,671,879,843	32,117,312	4,580,493	16.63	November.....	34,121,128
" 31...	1874.....	13,903,197,493	2,180,378,461	38,090,952	5,973,640	18.59	March.....	43,717,404
Dec. 31...	*1875 (	10,957,252,996	† 739,722,760	39,844,556	1,753,604	7.24	April.....	41,461,262
" 31...	1876 (	14,525,858,798	.....	39,688,138	.....	.....	August.....	44,408,695
" 31...	1877.....	11,958,977,646	.....	32,764,323	.....	.....	* May.....	37,237,833

† Compared with same months of the year before.  
\* Exclusive of quantity pumped by "West Works."

## SHOPS.

The following hydrants, stop-valves, etc., have been manufactured during the past year, in the shop connected with these works:

## NEW HYDRANTS.

Four-inch (double nozzle).....	67
Two and a half inch (double nozzle).....	12
Two inch (single nozzle).....	41
<hr/>	
Total manufactured.....	120
of this number, there have been put in use.....	116
<hr/>	
On hand January 1st, 1878, (4 inch).....	4

## NEW STOP VALVES.

Four-inch.....	110
Six-inch.....	91
Eight-inch.....	54
Twelve-inch.....	17
Sixteen-inch.....	7
<hr/>	
Total manufactured.....	279
Of this number, there have been used.....	247
<hr/>	
Leaving on hand January 1st, 1878....	32
of the following sizes, viz:	
Four-inch.....	4
Six-inch.....	10
Eight-inch.....	10
Twelve-inch.....	3
Sixteen-inch.....	5—32
<hr/>	

There is also on hand, made last year, one 24-inch valve.

In addition to the foregoing work, a number of hydrants and stop-valves have been more or less repaired, and considerable other work has been done for the various city departments.

The total expenditures for labor and material on account of shop, including value of stock on hand January 1st, 1877, is..... \$18,262.11

Charged to the following accounts, viz:

Water Department, operating expenses, \$	2,128.87	
New hydrants and stop valves.....	9,287.23	
Pipe extension.....	530.10	
Meter department.....	124.99	
Tapping department.....	44.36	
Fire department (coal and tools).....	481 95	
Street department.....	36.57	
Sewer department.....	7.79	
Bridge department.....	10.80	
Fullerton avenue conduit.....	36.67	
Washington and La Salle streets tunnels	31.53	
Council chamber (City Hall).....	10.43	
Expense running shop, coal, oil, gas, etc	1,110 95	
Superintendence (deducted from en- gineer's salary).....	360.00	
Scrap iron sold.....	109.52	
Stock on hand January 1st, 1878.....	3,950.35	
Total.....	\$18,262.11	\$18,262.11

The value of the work done in the shop, estimating the same at less than current prices for like articles, is.....	\$20,249.12
Add coal used by fire department.....	253.40
Deduct cost, as shown.....	\$18,262.11
Deduct 10 per cent. for interest and depreciation of tools, etc., costing \$6,-	
786.72.....	678.67
Leaving the nominal net earnings of shop.....	1,561.74
	<hr/>
	\$20,502.52
	<hr/>

Cost of tools previously reported.....	\$6,704.69
Added by repairs past year.....	82.03
	<hr/>
Present value of tools.....	\$6,786.72
Value of stop-valves and hydrants before noted, as on hand January 1st, 1878, together with the raw material in the shops, is.....	3,950.35
	<hr/>
Total value of stock and tools..	\$10,737.07
	<hr/>

The portion of the shop building formerly used as a stable, has been devoted to the use of the Fire Department shops, and a new stable building 27 by 42 feet has been erected a few feet east of the main building. This structure was completed latter part of September last. The walls were laid up by men from the Fire Department. The wood and other work being executed by the employes of the pumping works.

The horses belonging to the Water Department were immediately removed from the "Armory" building and have since been stabled in the new quarters.

The outside surface of walls of the shop building need some repairs. The interior has been whitewashed. The wood work will receive a coat of paint during the ensuing year.

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## GENERAL REVIEW.

### ENGINES.

Engine "72" received a pretty general overhauling during January and a part of February last. Both working beams were taken out of pillow blocks in order to fit new keys in the main journal shaft. Other repairs were made upon the pumps, a portion of the foundation, and wherever necessary.

An apparatus has been devised for the purpose of introducing an air cushion in the main water pumps. This device has proved very satisfactory in its operation, relieving the engine of any jar or concussion whatever.

After repacking and cleaning the engine referred to, it was started on the 17th of February, 1877, and has continued to run night and day to date of this writing (March 31st, 1878), a period of 13 months and 11 days, consequently not one dollar has been expended upon this engine for repairs for more than a year. It will be stopped in course of a few weeks and receive such repairs as may be necessary, preparatory to the ensuing warm season.

At date of last report the pumps of engine "67" were being fitted with a set of new valves of the "double beat" variety. The main valve is 15 inches diameter, made of cast iron. The seat is also of cast iron, with a wood face. The supplemental

valves are 6 inches diameter, made of composition metal, the seats being of same metal. All the work upon these valves upon the engines generally was done at the city shop. The pumps were also fitted with new valves. These, with other repairs upon the engine, were completed and the engine started April 17th, continuing to run 12 to 15 hours every day since.

The new pump valves have worked highly satisfactory. The engine, as a whole, working very smoothly and without repairs during the time referred to.

The steam channels of this engine need some little re-fitting as portions were somewhat damaged by the fire of 1871, but there has been no convenient opportunity to do this work, as the engine has been in service most of the time since.

#### PROVISIONS FOR THE FUTURE.

While the pumping facilities at hand may be regarded as an element of security against any serious interruption to the supply, yet there may be times when at least the "head" of water may be more or less unsatisfactory, owing to the temporary stoppage of one of the large engines for ordinary repairs.

It will be seen by reference to the tables that the old single engines "53" and "57" have been in operation only about 10 days during the year, although they are in good condition considering their age and service. The limited capacity of these engines render them of little service in supplying the quantity now required by the city. They are used only when one of the larger engines are stopped.

The two double engines at these works, together with the engines at the west works, have pumped nearly all the water

during the past year, and it is believed that the supply throughout the city—although very large—has at all times been abundant, and been delivered under an ample “head” or pressure. Doubtless these desirable conditions will continue to be the rule for some time to come.

The suggestions made upon this subject three years ago in the Fourteenth Annual Report of the B. P. W. (see p. 35, 36, 37 and 38), might with propriety be reiterated at this time, but a simple reference to the matter may be sufficient.

#### BOILERS.

By reference to the expense account it will be seen that the repairs on the five boilers during the year have cost less than \$500.00, being a fraction over four cents for each million gallons of water pumped. These boilers are each 12 feet in diameter and 20 feet long. Three of them have been in use about five years, one of them eight years, and the other something over ten years. Four of them are in good condition. The oldest one, however, begins to yield under long continued service, and may soon require more extensive repairs.

It will be borne in mind that the term of service referred to at these works for both boilers and engines includes twenty-four hours per day during the entire year, while ordinarily ten to twelve hours daily for three hundred days of the year constitute the service of steam machinery in general use.

All the boilers at these works were proportioned so as to make them conform to the size and shape of the then existing building. It is quite likely that when the boilers require any extensive repairs it will be worth while to consider the propriety of enlarging the boiler-houses and replace the present large



boilers with a greater number of smaller ones, enabling the engines to be operated under a higher pressure of steam than is now practicable, and thereby a proportionate economy in the consumption of fuel.

#### EXPERIMENTS FOR PREVENTION OF SMOKE.

During the year several devices have, at different times, been attached to the boilers, and tests made in regard to their alleged merits. These arrangements are known respectively as the "Lester," "McGinnis," "Stevens" and "Nott" "smoke burners." An arrangement for a like purpose, devised at these works, was also attached to one of the boilers. A record of the results of the several tests was placed in your hands soon after they were made.

#### BUILDINGS.

The buildings have received no repairs of consequence during the past year, except the outside of the roof of the main port which was painted in April last. Since which time it has not leaked as badly as before. The ceiling remains in same deteriorated condition as at date of last report, owing to the plaster having been badly damaged during the work necessary to strengthen the main roof. To remove the balance of old and put on new plaster will be a very annoying as well as very inconvenient job, as it must be done while engines are in operation. Much danger and trouble would be avoided if an entire new ceiling were put up immediately under, but independent of the old one. The walls and ceiling of the lower story of main building and those of the offices, sleeping rooms and vestibule have been neatly calcimined. The tower and standing pipe remain in good condition, except the window frames, doors, etc., which are exposed to the weather, are sadly in need of repainting, nothing of the kind having been done to them since they were put up. The same is true of the wood work in all the buildings.

## TELEGRAPH.

Telegraphic communication is now established between these works, the west pumping works, the lake crib, and the city hall. The convenience and importance of this arrangement has on several occasions been fully demonstrated. The cable connecting the crib with the shore has been boxed and put under ground as a measure of safety against damage.

## THE GROUNDS

West of building remain in excellent condition, although a few thrifty trees are required to take the place of those that are dead.

The portion of iron fence on the southwest corner, which was displaced in a gale of wind, has been repaired, and the entire fence around the premises has received a coat of paint.

The large fountain referred to in last report has been removed from the carriage way affording plenty of room for passing vehicles. Its absence is duly appreciated by a large number of persons who daily drive over what has now become a thoroughfare to and from the "shore drive."

A portion of the old wrought-iron fence, formerly in use in front of the original building, has been reset upon stone pedestals or posts, placed on the north line of Chicago avenue, extending from east end of boiler-house to west end of work shops.

The grounds lying east of main building remain same as last reported, except that a wooden fence has been constructed on north side of shop building inclosing a space which is used to

store castings, etc., and also to form a covering for the tappers and other wagons.

#### MISCELLANEOUS.

Nothing has occurred during the year to interrupt the flow of water from crib to pumps, although this was threatened for an hour or two on the fifteenth of January last when the gates at the crib were nearly blocked up with ice, during the prevalence of a violent storm, the wind having a velocity of sixty miles per hour. Again on November 9th last during a very heavy storm, the water in the lake rose so high that it backed up in the channel used to carry off the ejection water from air pumps, flooding the boiler-rooms to a depth of twelve inches. The heavy seas also washed away much of the filling at the end of both Chicago avenue and Pearson street. The substantial aqueduct and piling since put in the old inlet basin, and at the end of Pearson street, will prevent a repetition of a similar annoyance and damage in the future.

#### ACCIDENTS.

During the progress of the work of strengthening the iron roof of main building, one of the employes of American Bridge Company, accidentally fell from ceiling to stone floor, a distance of forty feet. In the descent the man came in contact with a seventeen inch copper pipe which broke the force of the fall and probably prevented fatal consequences.

On November 17th last D. W. Fuller, an old employe of these works, while engaged in whitewashing the ceiling of the shop building was caught by a rapidly revolving shaft receiving serious injury, his left arm being so badly broken in several places that, at first, amputation was deemed necessary, but I am

pleased to report that the limb was saved and, although suffering several months, the man is rapidly recovering.

Assistant Engineers Trautman, Horner, Cregier, and others, constituting the force at these works, have each and all been prompt, efficient and faithful in the discharge of their respective duties.

Respectfully,

DEWITT C. CREGIER,

*Engineer.*

# OPERATIONS AT THE WEST PUMPING WORKS.

The following statements have been prepared from the records kept at the works:

## ENGINE 26, OR EAST ENGINE.

DATE.	Steam pres at engine.	Vacuum	Height of water in ft.	Receiver.	No of hours run.	Total revolutions.	Cost incurred for pumping, heating building and pumping out dry well.	Total anal. of coal burned for all purposes.	Atten.	U. S. coal delivered into city allowing 5% p. c. for loss of action, etc.	Cubic feet of water fed into boilers	Temperature of flues at back of damper.	Duty for 100 lbs. of coal burned.
1877.					H. M.		IN POUNDS.						
January...	60	...	115½	.....	721 25	438,083	597,137	611,216	.....	438,083,000	.....	.....	70,186,787
February...	60½	12½	108	.....	638 36	389,268	612,312	648,112	.....	389,268,000	.....	.....	68,078,525
March .....	64½	12½	106½	.....	187 ..	116,981	170,900	178,900	.....	116,989,000	.....	.....	60,558,292
April.. .....	61	12½	127	.....	173 57	114,514	152,800	173,200	.....	114,514,000	.....	.....	79,271,710
May.....	56	12½	97½	.....	173 15	108,661	125,980	128,980	.....	108,661,000	.....	.....	69,823,580
June.....	54	12½	100	6	648 30	436,229	526,280	529,870	.....	436,229,000	.....	.....	68,903,769
July. ....	51	12½	104½	5½	616 ..	297,426	382,500	390,163	.....	297,426,000	.....	.....	66,820,382
August.....	50	12½	106½	5½	403 15	324 112	456,100	459,100	.....	324,112,000	68,790 328	.....	63,114,078
September.	50½	12½	105½	5½	578 ..	312,857	425,700	425,700	.....	312,857,000	59,849 825	.....	64,577,604
October .....	50½	12½	106½	5½	601 80	316,677	419,200	422,200	.....	316,677,000	64 2' 6 358	.....	67,094,428
November..	51½	12½	111½	5	547 ..	292,250	404,100	404,100	.....	292,250,000	60,727 384	.....	68,912,288
December ..	54	12½	108½	5½	505 ..	307,116	420,900	427,300	.....	307,116,000	60,4636 392	.....	60,020,089
	55½	12½	108½	.....	5,972 28	3,454,042	4,593,809	4,608,841	.....	3,454,042,000	.....	.....	.....

Anthracte coal used previous to June 7th. Commenced using soft coal June 7th. From and after the 7th July coal used for banking fires at night is charged to pumping.

# ENGINE 25 OR WEST ENGINE.

DATE.	Steam pres. at Engine.	Vacuum.	Height of Water in feet.	Receiver	No. of hours run.	Total revo- lutions.	Coal burned for pumping, heat- ing building and pump, g out dry well	IN POUNDS.	Total amount of coal burned for all pur- poses.	Ashes.	U S. gall. deliv- ered into city, allowing 5% per cent for loss of action, &c	Cubic feet of Water fed into boilers.	Temperature of Flues at back of damper	Only for 100 lbs. of coal burned.
1877.														
January.....	60	12 1/2	116 1/2	4 1/2	639 05	425,474	577,700	589,206	589,206	.....	425,474,000	.....	.....	70,787,745
February.....	60 3/4	12 1/2	110	5	405 42	241,087	330,600	838,600	838,600	.....	241,087,000	.....	.....	66,018,164
March.....	62 1/2	12 3/4	120 3/4	4 1/2	557.	337,983	477,280	510,480	510,480	.....	337,983,000	.....	.....	77,571,020
April.....	60 1/2	12 1/2	140 1/2	5 1/2	501 03	308,374	419,186	452,966	452,966	.....	308,374,000	.....	.....	76,608,386
May.....	56 1/2	12 3/4	100 1/2	6 1/2	553 50	365,069	395,670	409,670	409,670	.....	365,069,000	.....	.....	76,963,568
June.....	53	12 1/2	98 1/2	6 1/2	71 55	49,550	57,120	57,120	57,120	48,411	49,550,000	.....	.....	71,035,423
July.....	51	12 1/2	100 1/2	5 1/2	534 27	320,617	411,000	419,200	419,200	17,865	320,617,000	.....	.....	65,035,749
August.....	50	12 1/2	105 1/2	5 1/2	610 30	342,154	469,320	472,220	472,220	23,547	342,154,000	69,871,926	.....	63,991,961
September.....	49 1/2	12 1/2	105 1/2	5 1/2	588,45	322,794	443,900	444,100	444,100	27,179	322,794,000	62,404,824	.....	63,253,375
October.....	50	12 3/4	106 1/2	5 1/2	582 00	307,387	419,460	421,000	421,000	24,252	307,387,000	65,101,859	.....	65,329,682
November.....	51	12 1/2	111 1/2	5 1/2	571 00	307,447	428,750	428,750	428,750	28,107	307,447,000	64,497,378	.....	66,419,345
December.....	54	12 3/4	110 1/2	5	560.30	306,549	416,600	418,000	418,000	33,188	306,549,000	57,053,892	.....	67,030,487
	55	12 1/2	110 1/2	5 1/2	3,244.47	3,634,085	4,846,400	4,956,272	4,956,272	.....	3,634,085,000	.....	.....	.....

Anthracite coal used from January to 7th June. Bituminous coal used after 7th June. From and after 7th July, coal used for banking fires in one boiler every night is charged to pumping.

# SECOND ANNUAL REPORT OF

*Statement obtained from the Bookkeeper of the Department of Public Works of Expenses at the West Side Pumping Works during the year 1877:*

## FUEL ACCOUNT.

FUEL ACCOUNT.	Tons.	Lbs.	Tons.	Lbs.		
Coal on hand January 1, 1877.....			40	500	\$6.48	\$260.82
Received of Lackawana Coal.....			1,878	1,490	"	11,974.27
Received of Lehigh Coal.....			121	1,515		953.74
Received of Erie Coal.....			18	1,720	6.00	118.16
Received of Brookfield Coal.....			8,439	1,000		15,800.81
COAL USED.						
Used for pumping, heating etc.....	4,828	1,118				
Used for water-pipe extension and testing.....	12	846				
On hand January 1, 1878.						
Brookfield Coal.....	648	1,306				
Lackawana Coal.....	14	1,560				
	5,499	825	5,499	825		\$28,602.80

## EXPENSES DUE TO PUMPING.

Salaries of engineers, firemen, labor etc.....	\$15,823.31
4,828 <sup>1118</sup> / <sub>2000</sub> tons of coal, at an average of \$5 <sup>22</sup> / <sub>100</sub> per ton	25,623.47
886 <sup>1</sup> / <sub>4</sub> gallons of lard oil.....	719.38
940 <sup>1</sup> / <sub>4</sub> gallons of cylinder oil.....	1,034.55
182 pounds lubricating grease.....	73.00
192 gallons boiler compound.....	192.00
1360 pounds of waste.....	125.94
Gas for lighting works.....	1,180.20
Rubber and other packing.....	475.14
Repairs on boilers and engines.....	1,123.61

New tools, blocks, ropes, etc.....	681.77
Iron work .....	494.90
Red and white lead.....	12.75
Fire-bricks and fire-clay.....	182.00
Fire-clay tiles for smoke consumers.....	351.92
New rubber pump valves.....	443.94
Small stores.....	351.92
	<hr/>
	\$48,919.80

Cost of delivering water per million gallons.....	\$6.90 <sup>2</sup> / <sub>10</sub>
Cost of repairs per million gallons. ....	.22 <sup>1</sup> / <sub>10</sub>

Of the above items charged to pumping expenses, several were considerably larger than will be necessary the present year, and a reduction of \$2,500 is looked for.

These works have been since May last under the immediate charge of Mr. Henry Mason, who had previously superintended the construction and erection of the engines for the contractors, and who has been assisted by Messrs. Faron, Stewart and Hill. Owing to the intimate connection between these and the north pumping works, both delivering into the same system of mains, it has often been necessary to send instantaneous messages from one to the other, for which fortunately the telegraph has been at hand, and without which it would be impossible to work such a combined system satisfactorily.

The machinery and boilers are believed to be in as good condition as they were in at the date of the last report. Constant care has been exercised to economize in the use of fuel. In the early part of the year considerable annoyance was caused by the breakage of the India rubber valves in the pumps, but



by making the new ones of better and stouter material, it is believed that much of this difficulty has been overcome.

About 125 feet of dock and a wooden coal shed capable of holding 800 tons, were built during the year. A permanent iron shed, of greater capacity and convenience is very desirable.

The buildings and grounds are in very much the same state they were in at the beginning of last year. A few thousand dollars, whenever they can be spared for the purpose, might be judiciously expended in improving the grounds, and would add greatly to the attractions of the works, which are objects of such public interest.

#### COMBINED OPERATIONS OF NORTH AND WEST WORKS.

The reported operations of both pumping works show a total number of gallons pumped during the year 1877 of 19,047,104,636, or an estimated daily average for the whole city of 52,184,000 gallons: and a total cost of pumping all the water delivered during the year 1877 of \$133,785.70, or an average of \$7.02 4-10 per million gallons.

## CONSUMPTION OF WATER.

To show the progress of water consumption and demand in various bearings, the following statement has been corrected from previous reports, and brought up to the end of 1877. The average daily quantity pumped is the same as heretofore stated for all years previous to 1877, and means pump measurement, without any allowance for leakage of valves or pumps. For 1877, a deduction of about six per cent. on this account was made. A great many trials prove that this loss is very variable here, and experience elsewhere shows that we are not alone in this respect. Further experiments are to be made this year, to ascertain, if possible, a satisfactory average of the leakage here.

## TABULAR STATEMENT OF THE CONSUMPTION AND WASTE OF WATER.

[illegible]

A careful study of the foregoing table while showing the gratifying fact that the city has a very valuable source of income, as well as other advantages in the Water Works, will also show that the waste of water has become so excessive as to threaten most serious evils unless it can be prevented. This is a subject to which much attention has been given in the cities of this country as well as in those of Europe, and will probably receive much more before the difficulties in the way of preventing waste can be satisfactorily overcome.

If meters could be universally introduced, they would undoubtedly prevent waste, but unfortunately the income from a large class of buildings, especially with our present very low meter rates, would be very small.

The causes of waste have received much attention from this department for many years past, and appeals to the public with regard to it, have been made from time to time, and yet the evil is alarmingly on the increase.

During the last and remarkably mild winter, when the force usually employed in looking after hydrants could be partly employed in searching for waste, much was done by examining the sewers in different parts of the city at night. In this manner the drains from several thousand houses were observed during those hours when the inhabitants, with very few exceptions, are supposed to be asleep, and consequently not using water. It was discovered that the waste from small houses was comparatively very slight. It was so, too, from the great majority of the better class of houses, but there were exceptions enough to show that a similar waste throughout the city was sufficient to account for the excessive average supply to each inhabitant. For obvious reasons, such houses could not be entered, and the precise causes of waste ascertained, but it was evident that

nine-tenths of it, if not more, proceeded from water closets, left running carelessly or intentionally, or allowed to get out of order and remain so. In 1870, efforts to ascertain the cause of the waste of water, then becoming serious, led to the discovery that water closets were by far the greatest.

In London and in New York, they seem to fear that meters alone will prevent waste and the consequent suffering and inconvenience of those who live in the most elevated or imperfectly supplied districts, and put off as long as possible the necessity of enlarging the works at heavy cost. House to house inspection for the prevention of waste appears to have failed everywhere to produce lasting or satisfactory results. It is very expensive if thoroughly carried out, and as soon as the inspectors' backs are turned the waste often goes on as before.

During the examinations of last winter one or two very suggestive occurrences took place. Occupants of houses where waste was taking place happened to be up and observed the inspectors as they went with lanterns to get their numbers. On learning who the inspectors were and what their object was the occupants promised to stop the waste, and insisted upon not being reported at the water office. Could some cheap device make a noise or show a light in the street where water flows through a service pipe, so that policemen and others might notice it during the still hours of the night, people who now have no scruples about reckless waste might be deterred by the fear of exposure; at least it would be practicable then to obtain at reasonable cost sufficient evidence to justify shutting off the water from such premises.

#### QUALITY OF THE WATER.

Nothing different from former years can be said in this respect, except that the mildness of the past winter, and the

great scarcity of ice, allowed winds to agitate the surface of the lake to such an extent as to render its water unusually turbid, but this has in no wise effected its healthfulness.

#### INLET BASINS.

Owing to the possibility felt ever since the completion of the Lake Tunnel that something might happen either to the tunnel or the crib to interrupt the supply to the city, it has been deemed important to keep open the connection between the shore and the wells of the North Pumping Works, or at least to be able to open them in a very short time. Considerable sums have been spent for this purpose. The unfavorable action of the lake along the north shore, the last two or three years, made it seem best to extend the inlet to the outer end of the old breakwater, and this was accordingly done by constructing an enclosed channel of wood twelve feet wide and seven deep at ordinary water, with a settling basin thirty feet wide and eighty feet long. The channel and basin are provided with gates to keep out water in case they should need cleaning out. Owing to the great amount of old pile work and stone in the Inlet Basin the construction of this channel was very troublesome. The channel is connected with the New Lake Tunnel and, consequently with the West Side Pumping Works. It is to be hoped that it will never be needed, but it would be very unwise to be without it, or its equivalent.

The old breakwater has been somewhat repaired, to protect the Inlet Basin at the end of Pearson street, but not sufficiently for permanent safety. It should be still further strengthened. This work was in the immediate charge of Mr. S. G. Artingstall, and Mr. Geo. R. Bramhall was foreman.

If the practice of taking away sand and gravel from the lake shore could be prevented, as well as the construction of piers

without reference to any interests but those of private individuals, not only the public would be protected, but private individuals also.

### RESERVOIRS.

These are in the same condition as that described last year.

### DISTRIBUTING PIPES.

There were laid during the year ending December 31, 1877, the following main and distributing pipes, viz.:

#### SOUTH DIVISION.

ON WHAT STREET.	BETWEEN WHAT STREETS.	Length in feet	Diam. in inches
Auburn street.....	To connect at Thirty-fifth street.....	26	6
Calumet avenue.....	Thirty-third and south to connect.....	301	8
Dearborn place.....	Randolph and Washington streets.....	470	8
Forest avenue . . . . .	Thirty-eighth street and north to connect.....	1,111	6
Franklin street.....	In connection at Lake street.....	12	4
Hanover street.....	McGregor and Twenty-fifth streets.....	300	8
Haynes court.....	Lyman street and north to connect.....	178	6
Halsted street.....	Thirty-first and Twenty-ninth streets.....	1,922	8
Jackson street.....	Clark street and Fifth avenue.....	804	8
Keely street.....	Archer avenue and southward.....	433	6
Kossuth street.....	Halsted street and eastward.....	60	6
Market street.....	In connection at Lake street.....	8	8
Market street.....	In connection at Lake street.....	9	4
Thirteenth street.....	Wabash and Michigan avenues.....	457	8
Thirty-fifth street.....	Auburn street and westward.....	276	4
Twenty-fourth street....	Wentworth and Portland avenues.....	260	8
Wentworth avenue.....	Eighteenth and Twenty-second streets.....	1,605	12
Wentworth avenue.....	To "blow off" at Twentieth street.....	30	6
		8,262	
	Hydrants.....	400	
	Total.....	8,662	

## WEST DIVISION.

ON WHAT STREET.	BETWEEN WHAT STREETS.	Length in feet	Diam in inches
Adams street.....	Hoyne and Hamilton avenues .....	339	6
Adams street.....	Oakley street and westward.....	200	6
Ashland street.....	Robey and Cypress streets.....	560	6
Ashland avenue.....	Sixteenth and Seventeenth streets.....	285	8
Augusta street.....	In connection at Milwaukee avenue .....	18	6
Brown street.....	Nineteenth street and southward .....	250	6
Bryson street.....	Lincoln street west of Robey.....	944	6
Clayton street.....	Johnson and Brown streets.....	398	6
Canal street.....	Adams and Randolph streets.....	1,990	12
Canal street.....	Wright and Fifteenth streets.....	228	8
Cypress street.....	Ashland street and southward .....	153	6
California avenue.....	North avenue and southward.....	334	6
Cornell street.....	Milwaukee avenue and westward.....	12	8
Cornelia street.....	Milwaukee avenue and westward.....	19	8
Cleaver street.....	Milwaukee avenue and northward.....	57	6
Clybourn place.....	Robey and Elk Grove streets.....	680	6
Division street.....	End of pipe and west of Lincoln street.....	296	8
Elston road.....	Milwaukee avenue and northward.....	60	8
Ewing place.....	Robey street and westward.....	450	6
Fifteenth street.....	Canal and Halsted streets.....	2,155	8
Fifteenth street.....	To "blow-off" at Jefferson.....	30	6
Fig street.....	Milwaukee avenue and westward.....	23	6
Fowler street.....	Hoyne avenue and Leavitt street.....	630	6
Gurley street.....	Morgan street and westward.....	60	6
Gresham street.....	Western and Campbell avenues.....	660	6
Green street.....	Pratt street and Chicago avenue.....	470	8
Halsted street.....	Fifteenth and Wright streets.....	228	8
Henry street.....	Throop street and Blue Island avenue.....	456	8
Hoyne avenue.....	Congress and Harrison streets.....	332	6
Harrison street.....	Ashland and Mansfield avenues.....	307	8
Indiana street.....	Union street and Milwaukee avenue.....	614	8
Iowa street.....	Robey and Lincoln streets.....	632	6
Jane street.....	Milwaukee avenue and westward.....	32	6
Lafayette street.....	Monroe and Adams streets.....	426	6
Lincoln street.....	Ellin and Bryson streets.....	170	6
Madison street.....	In connection at Canal street.....	36	8
Marshfield avenue.....	Congress and Harrison streets.....	350	6
Monroe street.....	Campbell avenue and westward.....	246	6
Macedonia street.....	Ellin and Division streets.....	832	6
Milwaukee avenue.....	Chicago avenue and Division street.....	4,214	12
Noble street.....	Milwaukee avenue and westward.....	14	8
North avenue.....	California avenue and North street.....	1,630	4
Oakley avenue.....	Harrison and Van Buren streets.....	774	6
Oakley avenue.....	Polk street and Evegreen place.....	399	6
Oakley avenue.....	Adams street and southward.....	225	6
Ogden avenue.....	Western avenue and northeast.....	265	6
Polk street.....	Hermitage avenue and eastward.....	334	8
Polk street.....	Winchester avenue and Robey street.....	272	8
Park street.....	Robey and Fowler streets.....	925	6
Park street.....	Wood and Lincoln streets.....	434	6
Robey street.....	Fifteenth street and Ashland street.....	408	12
Robey street.....	Twelfth street and southward.....	70	6
Randolph street.....	Canal and Clinton streets.....	408	12
Rucker street.....	In connection at Milwaukee avenue.....	20	8



## WEST DIVISION—Continued.

ON WHAT STREET.	BETWEEN WHAT STREETS.	Length in feet.	Diam in inches
Ridgville road.....	Bloomington road and Waubansia avenue....	150	6
Robey street.....	Evergreen street and southward.....	507	8
Rockwell street.....	Lake street and northward.....	532	6
School street.....	Desplaines street and westward.....	385	4
Sixteenth street.....	Lafin street and westward.....	217	6
Seventeenth street.....	Ashland avenue and Paulina street.....	705	6
Sumner street.....	Fifteenth and Sixteenth streets.....	396	6
Sacramento street.....	Jackson street and south to connect.....	187	8
Sangamon street.....	Chicago avenue and Pratt street.....	412	6
Shober street.....	North avenue and northward.....	455	6
Twelfth street.....	In connection at Robey street.....	24	6
Van Buren street.....	Loomis street and westward.....	35	6
Wright street.....	Halsted street and Newberry avenue.....	292	8
Wood street.....	Fifteenth street and N. W. R. R. tracks.....	422	8
Winchester avenue.....	Polk street and northward.....	642	6
Will street.....	Milwaukee avenue and northward.....	67	8
Waubansia avenue ....	Milwaukee avenue and Robey street.....	740	6
Washington street.....	Rockwell street and westward.....	750	6
		33,246	
	Hydrants.....	1,100	
	Total.....	34,346	

## NORTH DIVISION.

ON WHAT STREET.	BETWEEN WHAT STREETS.	Length in feet.	Diam in inches
Clark street.....	Fullerton avenue and southward.....	30	8
Division street.....	State street and Astor place.....	50	8
Elm street.....	Bremer and Crosby streets.....	1,200	8
Eastman street.....	Halsted street and westward.....	150	6
Hills street.....	Wells street and eastward.....	225	4
Market street.....	Schiller street and North avenue.....	1,170	6
Pine street.....	In connection at Huron street.....	50	8
Rush street.....	Cedar and Oakwood streets.....	130	4
Vedder street.....	Halsted street and westward.....	50	6
Wesson street.....	Across Elm street.....	75	8
Walton place.....	Rush street and westward.....	150	6
		3,840	
	Hydrants.....	750	
	Total.....	4,590	

The whole length of pipe laid in the city during the year was 47,604 feet, or about nine miles; 1,264 feet four inch pipe was taken up out of the ground and 470 feet worthless three inch abandoned, and larger pipe laid down instead, which would leave an actual increase in length of pipe extension of 45,870 feet or about 8 7-10 miles.

The total length of pipes laid and in use at this date, as nearly as can be ascertained, is as follows, viz.:

						Lineal Feet.
24	inch	wrought	iron	syphon	pipe at Twelfth street	258
36	"	cast	"	main	"	24,511
30	"	"	"	"	"	18
28	"	"	"	"	"	160
24	"	"	"	"	"	67,955
16	"	"	"	"	"	57,136
12	"	"	"	"	"	113,998
10	"	"	"	"	"	8,012
8	"	"	"	"	"	400,828
6	"	"	"	"	"	855,094
4	"	"	"	"	"	692,131
3	"	"	"	"	"	21,690
						<hr/>
						2,241,791

Or  $424\frac{3071}{5280}$  miles.

## HYDRANTS.

During the year ending December 31, 1877, the following hydrants were established, viz. :

## SOUTH DIVISION.

One north-east corner Archer avenue and Mary street.

One north-east corner Archer avenue and Joseph street.

\*One south-east corner Archer avenue and Lock street.

One north-west corner Forest avenue and Thirty-eighth street.

One south-west corner Halsted street and Thirty-third court.

\*One north-west corner Jackson and LaSalle streets.

\*One south-west corner Jackson and Sherman streets.

\*One north-east corner Jackson street and Fifth avenue.

\*One south-east corner Jackson street and Pacific avenue.

One west side Keely street between Archer avenue and Lyman street.

\*One north east corner Kossuth and Halsted streets.

One north-west corner Thirty-fifth court and Halsted street.

One north side Twenty-second street, between Wentworth and Archer avenues.

\*One south-west corner Wentworth and Archer avenues.

Total, South Division, 14.

## WEST DIVISION.

\*One north-east corner Adams and Oakley streets.

One north-east corner Ashland street and Cypress street.

\*One south-west corner Canal and Madison streets.

\*One west side Canal between Randolph and Washington streets.

\*One south-west corner Canal and Washington streets.

\*One south-west corner Canal and Monroe streets.

\*One south-east corner Canal and Randolph streets.

\*One west side Canal, between Madison and Washington streets.

\*One west side Canal, between Monroe and Adams streets.

One south-east corner California and North avenues.

One east side California avenue 330 feet south of North avenue.

One north-west Clybourn place and Dudley street.

\*One north-west corner Desplaines and Mather streets.

One north-west corner Desplaines street and Milwaukee avenue.

\*One north-west corner DeKoven and Clinton streets.

One south side Erie street at engine house near Green street.

One north side Forquer street, between Blue Island avenue and Halsted street.

One north-east corner Forquer street and Blue Island avenue.

One north side Forquer street, between Halsted and Desplaines streets.

One north-east corner Fowler and Leavitt streets.

\*One north-west corner Green and Superior streets.

One north-west corner Gurley and Morgan streets.

One north-east corner Grenshaw street and Campbell avenue.

One west side Halsted street opposite Meagher street.

One west side Halsted street opposite Sebor street.

One west side Halsted street opposite Mather street.

One north-west corner Halsted and Ewing streets.

One north-west corner Harrison and Halsted streets.

\*One north-east corner Harrison and Halsted streets.

One north-east corner Harrison street and Marshfield avenue.

One south-east corner Indiana and Union streets.

One south-east corner Indiana street and Milwaukee avenue.

One north-east corner Indiana street and Milwaukee avenue.

\*One north-east corner Jackson and Francisco streets.

One west side Morgan street, between Eleventh and Twelfth streets.

One south-west corner Morgan and Harrison streets.

\*One west side Morgan street, opposite Hope street.

One north-west corner Morgan and Polk streets.

\*One south-west corner Morgan street and Blue Island avenue.

\*One north-east corner Monroe and Oakley streets.

One north-east corner Mark and Halsted streets.

One west side Macedonia street, between Division and Elin streets.

\*One south-east corner Milwaukee avenue and Elston road.

\*One south-east corner Milwaukee avenue and Rucker street.

\*One south-west corner Milwaukee avenue and Cornell street.

\*One south-west corner Milwaukee avenue and Cornelia street.

\*One south-west corner Milwaukee avenue and Augusta street.

\*One south-east corner Milwaukee avenue and Division street.

One south-east corner Milwaukee avenue and Tell court.

\*One south-east corner Milwaukee avenue and Jane street.

\*One south-east corner Milwaukee and Chicago avenues

One west side Oakley, between Van Buren and Harrison streets.

One south-west corner Oakley and Van Buren streets.

One north-west corner Paulina and Seventeenth streets.

One north-west corner Polk street and Winchester avenue.

One north side Polk, between Halsted and Desplaines streets.

In center of Ruble street 500 feet south of Canalport avenue.

One north-west corner Robey and Bryson streets.

One south-west corner Robey street and Ashland street.

One north side Randolph, between Canal and Clinton streets.

\*One north-west corner Sangamon and Superior streets.

One west side Sumner street 400 feet south of Fifteenth street.

One north-west corner Sebor and Clinton streets.

\*One south side Twelfth street at engine house opposite May street.

One north-west corner Union and Meagher streets.

One north-west corner Van Buren and Loomis streets.

One north side Van Buren, between Throop and Loomis streets.

One north side Van Buren, between Halsted and Desplaines streets.

One west side Winchester avenue 600 feet north of Polk street.

Total in the West Division, 69.

## NORTH DIVISION.

Two north-west and north-east corners Blackhawk and Halsted streets.

One south-west corner Cass and Rush streets.

One south-west corner Cass street and Chicago avenue.

\*One north-east corner Division and State streets.

One south-east corner Elm and Chatam streets.

\*One south-east corner Elm and Crosby streets.

One north-west corner Eastman and Halsted streets.

\*One south-east corner Elm and Wesson streets.

\*One south-east corner Elm and Larrabee streets.

One north-west corner Haynes and Crosby streets.

One north-west corner Hills street and alley east of Wells street.

One north-east corner Halsted and Reese streets.

One south-west corner Market street and North avenue.

One north-west corner Market and Blackhawk streets.

One north-west corner Market and Schiller streets.

One south-east corner Rush and Cedar streets.

\*One southwest corner Superior and State streets.

Total North Division, 18.

In all, 101, making together with those previously in 3,002 hydrants in the City at this date, of which number 947 are of the double nozzle pattern; an increase of 75 since last year. Two hundred and fifty hydrants were repaired and 69 renewed during the year. Hydrants were found frozen and had to be thawed out in 3,072 cases during the past winter.

NOTE.--The asterisk \* in the margin denotes hydrants of the double nozzle pattern.

## STOPCOCKS.

The following stopcocks were put in during the year, v.

## SOUTH DIVISION.

One 6 inch, Archer avenue, east line Wentworth avenue.  
One 8 inch, Archer avenue, west line Hanover street.  
One 4 inch, Bushnell street, west line Hanover street.  
One 6 inch, Clark street, in blow off at Jackson street.  
One 8 inch, Calumet avenue, south line Thirty-third street.  
One 8 inch, Dearborn place, south line Randolph street.  
One 8 inch, Dearborn place, north line Washington street.  
One 4 inch, Dearborn Park, west line Dearborn court.  
One 6 inch, Fifth avenue, in blow off at Jackson street.  
One 4 inch, Fifth avenue, in blow off at Madison street.  
One 6 inch, Forest avenue, north line Thirty-seventh street.  
One 4 inch, Franklin street, south line Lake street.  
One 8 inch, Halsted street, south line Twenty-ninth street.  
One 8 inch, Jackson street, east line Fifth avenue.  
One 8 inch, Market street, south line Lake street.  
One 4 inch, Market street, south line Lake street.  
One 4 inch, Michigan avenue, south line Washington street.  
One 8 inch, Twenty-first street, east line Wentworth avenue.  
One 6 inch, Twenty-second street, east line Wentworth avenue.  
One 8 inch, Wabash avenue, in blow off at Madison street.  
Two 6 inch, Wabash avenue, in connection at Madison street.  
One 12 inch, Wentworth avenue, south line of Twentieth street.  
One 6 inch, Wentworth avenue, in blow off at Twentieth street.  
One 4 inch, Johnson place, at north end of pipe.

Total South Division, 25.

## WEST DIVISION.

- One 6 inch, Augusta street, in connection at Milwaukee avenue.
- One 6 inch, Ashland street, west line Robey street.
- One 6 inch, Bryson street, west line Lincoln street.
- Two 6 inch, Bryson street, east and west lines Robey street.
- One 6 inch, Brown street, south line Nineteenth street.
- One 8 inch, Canal street, in connection at Monroe street.
- One 8 inch, Canal street, in connection at Madison street.
- One 8 inch, Canal street, in connection at Washington street.
- One 6 inch, Canal street, in connection at Randolph street.
- One 6 inch, Canal street, in blow off at Washington street.
- One 6 inch, California avenue, south line North avenue.
- One 8 inch, Cornell street, in connection at Milwaukee avenue.
- One 8 inch, Cornelia street, in connection at Milwaukee avenue.
- One 6 inch, Cleaver street, north line Milwaukee avenue.
- One 6 inch, Clybourne place, east line Robey street.
- One 4 inch, Erie street, east line Milwaukee avenue.
- One 8 inch Elston Road, north line Milwaukee avenue.
- One 6 inch, Fig street, in connection at Milwaukee avenue.
- One 8 inch, Green street, north line Pratt street.
- One 8 inch, Green street, south line Chicago avenue.
- One 12 inch, Green street, north line Harrison street.
- One 6 inch, Grenshaw street, west line Western avenue.
- One 6 inch, Gurley street, west line Morgan street.
- One 12 inch, Harrison street, west line Halsted street.
- Two 8 inch, Indiana street, east and west lines Union street.
- One 8 inch, Indiana street, west line Halsted street.
- One 6 inch, Jane street, west line Milwaukee avenue.
- One 6 inch, Jefferson street, in connection at Fifteenth street.
- One 6 inch, Morgan street, north line Pratt street.
- One 6 inch, Macedonia street, north line Division street.
- One 12 inch, Milwaukee avenue, north line Chicago avenue.
- One 12 inch, Milwaukee avenue, west-line Rucker street.



One 4 inch, North avenue, west line Rockwell street.  
One 8 inch Noble street, in connection at Milwaukee avenue.  
One 6 inch, Park street, north line Fowler street.  
One 12 inch, Robey street, north line Twelfth street.  
Two 6 inch, Rucker street, in connection at Milwaukee avenue.  
One 8 inch, Robey street, south line Evergreen street.  
One 6 inch, Rockwell street, north line Lake street.  
One 6 inch, Sangamon street, north line Pratt street.  
One 4 inch, Sangamon street, east line Milwaukee avenue.  
One 6 inch, Shober street, north line North avenue.  
One 6 inch, Seventeenth street, west line Ashland avenue.  
Two 6 inch, Twelfth street, in "blow offs" at Halsted street.  
One 16 inch, Twelfth street, west line Halsted street.  
One 16 inch, Union street, 30 feet south of north line Indiana street.  
One 8 inch, Wright street, west line Halsted street.  
One 8 inch, Wright street, in connection at Newberry avenue.  
One 8 inch, Will street, north line Milwaukee avenue.  
One 6 inch, Wabansia avenue, east line Milwaukee avenue.  
Two 6 inch, Wabansia avenue, east and west line Robey street.  
Total West Division, 56.

## NORTH DIVISION.

One 4 inch, alley north of Reese street, east line Halsted street.  
One 6 inch, Blackhawk street, east line Halsted street.  
One 8 inch, Clark street, south line Fullerton avenue.  
One 4 inch, Cedar street, east line State street.  
One 4 inch, Cass street, south line Chicago avenue.  
One 6 inch, Chestnut street, east line Rush street.  
One 8 inch, Division street, east line State street.  
One 6 inch, Delaware place, east line Rush street.  
Two 8 inch, Elm street, east and west lines Crosby street.  
One 8 inch, Elm street, west line Bremer street.

Two 8 inch, Elm street, east and west lines Larrabee street.  
One 4 inch, Elm street, east line State street,  
One 6 inch, Eastman street, west line Halsted street.  
One 4 inch, Gardiner street, east line Halsted street.  
One 4 inch, Hills street, east line Wells street.  
One 6 inch, Market street, south line North avenue.  
One 6 inch, Market street, south line Blackhawk street.  
One 6 inch, Market street, north line Schiller street.  
One 4 inch, Oakwood street, east line Rush street.  
One 4 inch, Oak street, east line Rush street.  
Two 8 inch, Pine street, in connections at Huron street.  
One 8 inch, State street, south line Ohio street.  
One 12 inch, State street, south line Ohio street.  
One 6 inch, Vedder street, west line Halsted street.  
One 4 inch, Vedder street, east line Halsted street.  
One 6 inch, Walton place, east line Rush street.  
One 8 inch, Wesson street, south line Elm street.

Total North Division, 30.

In all 111, which, together with those previously in, would give 2,701 stopcocks of all sizes in the City at this date. During the year one received some necessary repairs, and two were renewed.

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## LAKE TUNNELS.

These are believed to be in good condition throughout. From the observations of divers at one or two points, and from the head required to deliver the supply of water, there is very little probability of there being much deposit on the bottoms of the tunnels.

## THE CRIB.

On account of serious apprehensions in the public mind, excited by alarming articles in the newspapers, extraordinary measures were taken in April of last year to ascertain the real condition of this structure. The Finance Committee employed Gen. Wm. Sooy Smith who, with the aid of divers, examined the substructure or wooden portion, and found nothing in that apparently out of order. Some of the masonry, however, he thought, might give serious trouble, in consequence of the tremendous action of the waves during great storms.

Some repairs of the masonry had been previously determined upon. These, together with such others as the examination under Gen. Smith suggested were commenced. About three-fifths of the loose filling between the outer and inner walls of the crib was taken out, as well as the rubble backing of the outer walls, and more solid work substituted. The diver, Capt. Peter Falcon, was employed to put bent iron plates each twelve feet long four feet high and one inch thick at each angle of the timber portion of the crib, the top of the iron being even with the bottom of the stone work. Each angle plate to be fastened with 60 one inch bolts, each twelve inches long. Capt. Falcon was also employed to drive oak wedges in the joints between the bottom of the granite courses and the top of the wood work where waves and frost appeared to have acted injuriously. While engaged in this, the discovery was made that the centres of the sides of the Crib had bulged about two inches—the dovetails of the crosstimbers having drawn out that much. Whether this was caused by imperfection in the original work or subsequent softening of the timber in the dovetails could not be determined; but the possibility that it might go farther, rendered precautionary measures advisable. Three kinds presented themselves: 1st, stone thrown around the outside of

the Crib to a sufficient height, say twenty feet above the bottom of the lake; 2d, removing the loose stone in the Crib and replacing it with concrete or rubble masonry, and third, putting in strong tie rods of steel between the outer and inner faces of the wood work. These were carefully studied, and it was finally decided to try to put 3-inch steel rods in the angle of the water ways and through holes bored in cross timbers. This work proved very tedious and difficult, particularly the boring through the cross timbers. By the last of February twenty-two of these rods were put in place, eight in the water ways and fourteen through the cross timbers. In the prosecution of this work much ingenuity was displayed amid much discomfort and discouragement, the details of which would be too tedious to repeat here. The joints of the masonry above water outside of the Crib were carefully raked out from two or three inches deep and pointed, the inside was cleaned, pointed and whitewashed, a new composition covering was put on the deck, a better light was got for the tower, the inside iron work painted, and the whole structure made neater looking than ever before. Mr. S. G. Artingstall had the immediate charge of the work, and Mr. Wm. Innes was the principal mechanic employed.

It would be advisable to spend about \$3,000 more, by putting rip rap to the height of twelve feet above the bottom of the lake around the Crib wherever there is not filling already to that height. There is clay filling still on the south side of the Crib—put there when the New Lake Tunnel was made, and its effect has been good. Loose stone was thrown in a similar manner around the bottom of the Cleveland Crib, and it proved decidedly beneficial in steadying the structure.

## SEWERAGE.

CHICAGO, December 31, 1877.

*Mr. E. S. Chcsbrough,**City Engineer:*

SIR.—Herewith is presented the usual annual statement of the sewers built during the past year, and tables showing the cleansing, repairs and alterations caused by street improvements, together with returns of private connections made with the sewers during the year.

Respectfully submitted,

WILLIAM H CLARKE,

*Assistant City Engineer.*

LENGTH IN FEET OF SEWERS BUILT TO JANUARY 1, 1878.

Diam in feet.	SOUTH DIV.		WEST DIV.		NORTH DIV.		TOTAL THREE DIVISIONS.		
	Previous to Jan'y 1. 1877.	From Jan'y 1. 1877. to Jan'y 1. 1878.	Previous to Jan'y 1. 1877.	From Jan'y 1. 1877. to Jan'y 1. 1878.	Previous to Jan'y 1. 1877.	From Jan'y 1. 1877. to Jan'y 1. 1878.	Totals Previous to January 1. 1877.	Totals January 1. 1877. to January 1. 1878.	Total Sewers built to January 1. 1878.
6½	.....	.....	.....	976	.....	.....	.....	976	976
6	2,408	.....	4,237	.....	3,895	.....	10,540	.....	10,540
5½	... ..	.....	3,934	.....	.....	.....	3,934	.....	3,934
5	8,798	320	47,355	.....	13,756	.....	69,903	320	70,229
4½	4,028	2,216	52,171	.....	9,615	.....	65,814	2,216	68,030
4	8,082	.....	60,138	2,699	10,706	1,186	78,926	3,885	82,811
3½	2,238	.....	20,504	.....	2,412	1,323	25,154	1,323	26,477
3¼	.....	.....	665	.....	.....	.....	665	.....	665
3	31,645	316	23,039	802	10,490	1,649	65,174	2,767	67,941
2½	68,381	.....	13,759	.....	26,099	993	109,262	993	110,255
2¼	6,359	.....	.....	.....	.....	.....	6,359	.....	6,359
2	96,260	8,799	245,089	11,128	97,954	5,203	443,222	25,130	468,353
1½	2,488	120	7,720	3,121	2,563	40	13,020	3,281	16,301
1	158,468	3,940	236,860	16,169	105,313	3 686	511,484	23,775	535,259
Total.	389,155	15,711	715,471	34,895	298,837	14,060	1,403,463	64,666	1,468,129
	404,866 feet		750,366 feet		312,897 feet.		or	or	or
	or		or		or		4263	1306	289
	28 per cent.		51 per cent.		21 per cent.		265— 5280 Miles.	12— 5280 Miles.	278— 5280 Miles.

The total amount expended for the construction of sewers during the year 1877, including catch basins and other accessories, and for the refunding of advances made in previous years by property owners, for building sewers, was \$117,879.88 distributed as follows, viz: South Division, \$24,384 47; West Division, \$61,093.44; North Division, \$32,401.97. In addition to the above amount there has been expended \$7,149.22 for bricks, pipes and manhole covers, which are still on hand for future use.

The entire expenditure for the construction of sewers and purchase of materials since the commencement of the work in 1855 is as follows:

South Division.....	\$1,312,989.94
West Division.....	2,461,846.47
North Division.....	1,004,504.15
	<hr/>
Total.....	\$4,779,340.56





### LOCATION OF SEWERS—Continued.

[illegible]

## FOURTEEN III WARD.

[illegible]



# LOCATION OF SEWERS—Continued.

ON WHAT STREET	FROM	TO	LENGTHS AND SIZES IN FEET.										TOTAL FEET.
			6½	5	4½	4	3½	3	2½	2	1½	1	

## UNEXECUTED CONTRACTS.

### FOURTH WARD.

Butte street 25, 30, 31 and 32nd sts.	Thirty-fifth street State street.	Thirty-ninth street Burnside street.	..	..	..	..	..	1,325	1,325	..	..	Estimated cost Less brick on hand	\$11,637 00 1,222 00 \$10,415 00
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### TWELFTH WARD.

Western avenue Taylor street Van Buren street	Van Buren street Oakley street Hoyne avenue.	Monroe street Campbell avenue Western avenue.	..	..	..	..	..	..	..	..	..	Estimated cost Less brick on hand	98,600 00
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## CATCH BASINS AND MAN HOLES BUILT IN 1877.

Built from January 1st, 1877, to January 1st, 1878.				Built Total 1877.	Built Previously.	Total.	Average Cost In 1877.
Divisions.	South.	West.	North.				
Catch Basins.....	98	158	107	363	7,218	7,581	\$38.70
Man Holes.....	110	229	92	431	7,839	8,270	10.15

## CLEANSING SEWERS FOR 1877.

Methods.	South Division		West Division.		North Division		Totals.		
	Feet Cleansed.	Cost.	Feet Cleansed.	Cost.	Feet Cleansed.	Cost.	Feet.	Cost.	Average per 100 feet.
By Flushing.....	118,885	\$2,244.70	206,293	\$3,702.48	112,930	\$2,072.10	438,108	\$8,019.28	\$1.83
By Chain Machine.	48,162	3,678.84	95,371	3,481.72	63,028	2,396.32	206,561	9,556.88	4.62
Total Sewers	167,047	5,923.54	301,664	\$7,184.20	175,958	\$4,468.42	644,669	\$17,576.16	\$2.72
Catch Basins.....	No. of 2,246	\$5,835.76	No. of 3,500	\$8,090.76	No. of 1,926	\$4,226.65	No. of 7,672	\$18,153.17	c't ea \$2.36
Total Cost ..		11,759.30		15,274.96		\$8,695.07		\$35,729.33	

## REPAIRS OF SEWERS, CATCH BASINS AND COVERS.

Division.	Sewers Repaired.	Cost.	Catch Basins No. of	Cost.	Covers	Cost.	Total Cost.
South Division.	{ 37 feet of 2 feet sewer on Vernon ave., rebuilt }	\$110.97	193	\$ 1,285.63	1,457	\$1,552.10	\$2,948.70
West Division.	{ 20 feet of box sewer } { 10 " of 4 ft. outlet } 95 ft. { 65 " of 2 ft. sewer }	177.44	283	2,151.37	1,635	1,570.14	3,898.95
North Division.	{ 8 feet 12 inch pipe sewer on Ontario street }	45.70	309	1,736.99	1,023	1,148.63	2,931.32
	Totals.....	\$334.11	785	\$5,173.99	4,115	\$4,270.87	\$9,778.97

## STREET INTERSECTIONS.

There have been raised to grade, where streets were to be filled and paved 883 catch basins and man holes at a cost of \$6,693.47.

# LOCATION OF SEWERS—Continued.

ON WHAT STREET	FROM	TO	LENGTHS AND SIZES IN FEET							TOTAL FEET.
			6"	8"	4"	3"	2"	1"	1	

## UNEXECUTED CONTRACTS.

### FOURTH WARD.

State street...	Thirty fifth street.	Thirty-ninth street...	...	...	...	...	1,325	1,325	...	Estimated cost	\$11,537.40
25, 36, 37 and 38th sts.	State street.	Burnside street	...	...	...	...	...	...	1,410	Less brick on hand.	1,235 00
											\$10,402.40

### TWELFTH WARD.

Western avenue ...	Van Buren street.	Monroe street	...	...	...	...	...	860	420	Estimated cost	\$4,600 00
Taylor street	Oakley street	Campbell avenue	...	...	...	...	...	...	1,400	Less brick on hand.	
Van Buren street.	Hoyne avenue.	Western avenue	...	...	...	...	683	1,200	...		

## CATCH BASINS AND MAN HOLES BUILT IN 1877.

Built from January 1st, 1877, to January 1st, 1878.				Built Total 1877.	Built Previously.	Total.	Average Cost In 1877.
Divisions.	South.	West.	North.				
Catch Basins.....	98	158	107	363	7,218	7,581	\$38.70
Man Holes.....	110	229	92	431	7,839	8,270	10.15

## CLEANSING SEWERS FOR 1877.

Methods.	South Division		West Division.		North Division		Totals.		
	Feet Cleansed.	Cost.	Feet Cleansed.	Cost.	Feet Cleansed.	Cost.	Feet.	Cost.	Average per 100 feet.
By Flushing.....	118,885	\$2,244.70	206,293	\$3,702.48	112,930	\$2,072.10	438,108	\$8,019.28	\$1.83
By Chain Machine.	48,162	3,678.84	95,371	3,481.72	63,028	2,396.32	206,561	9,556.88	4.62
Total Sewers	167,047	5,923.54	301,664	\$7,184.20	175,958	\$4,468.42	644,669	\$17,576.16	\$2.72
Catch Basins.....	No. of 2,246	\$5,835.76	No. of 3,500	\$8,090.76	No. of 1,926	\$4,226.65	No. of 7,672	\$18,153.17	c't ea \$2.36
Total Cost ..		11,759.30		15,274.96		\$8,695.07		\$35,729.33	

## REPAIRS OF SEWERS, CATCH BASINS AND COVERS.

Division.	Sewers Repaired.	Cost.	Catch Basins No. of	Cost.	Covers	Cost.	Total Cost.
South Division.	{ 37 feet of 2 feet sewer on Vernon ave., rebuilt }	\$110.97	193	\$ 1,285.63	1,457	\$1,552.10	\$2,948.70
West Division.	{ 20 feet of box sewer } { 10 " of 4 ft. outlet } 95 ft. { 65 " of 2 ft. sewer }	177.44	283	2,151.37	1,635	1,570.14	3,898.95
North Division.	{ 8 feet 12 inch pipe sewer on Ontario street }	45.70	309	1,736.99	1,023	1,148.63	2,931.32
	Totals.....	\$334.11	785	\$5,173.99	4,115	\$4,270.87	\$9,778.97

## STREET INTERSECTIONS.

There have been raised to grade, where streets were to be filled and paved 883 catch basins and man holes at a cost of \$6,693.47.

## PRIVATE DRAINS.

Permits issued from January 1, 1877 to December 31, 1878.

Division.	12 inch.	9 inch.	6 inch.	Total.
South.....	5	54	502	561
West.....	2	55	759	816
North .....	1	37	407	445
Totals.....	8	146	1,668	1,822

### CONDITION OF THE RIVER.

Since the building of the dam at the head of the Ogden and Wentworth Canal early in June, 1877, the condition of the South Branch of the Chicago River has greatly improved. The dam is located on the east line of section 12, township 38, range 11, 1,150 feet south of the north-east corner of the section; where the line crosses an arm of the Desplaines River with which the Ogden and Wentworth Canal is connected. It is temporary in its nature, being composed of a row of sheet piling supported on the lower side with round timber piles and filled on the upper side with earth.

Owing to the peculiarly unreliable character of the ground into which the sheet piles were driven, the joints between them proved to be very imperfect and leaked badly. To prevent a recurrence of this it is recommended that a row of longer, tongued and grooved, sheet piles be driven several feet from the old row, the two rows being thoroughly tied together to prevent spreading and the intermediate space filled with earth. By this means the dam may be made to do service for a number of years without any material repairs.

The top of the dam is about 11 8-10 feet above Chicago city datum.

During the greater part of the time no water flows over its top, hence the water from the Desplaines River is excluded from the Chicago River during the season of the year when its presence is seriously objectionable.

But for the continual foul condition of the contents of the North Branch, which, after rains of any considerable amount, are washed down into the South Branch, thus feeding it with contaminated water, instead of with pure lake water, it is believed that no offensiveness would be noticed now that the dam at the Desplaines River is in place.

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### FULLERTON AVENUE CONDUIT.

The account of the prosecution of the work upon the Fullerton avenue conduit, contained in the First Annual Report of the Department of Public Works, comprises the main features of interest attending its progress, from the inception of the scheme up to April 2d, 1877.

At that date the work remaining to be done to complete the contract of Fitzsimons & Connell, was the connection between the upper and lower grades of the conduit east of Racine avenue, the connection between the Lake shore and Larrabee street headings at Clark street, the sinking of five small shafts at street crossings, cleaning out the conduit, and the construction of the outlet shaft and pier in the lake.



The connection at Racine avenue was completed the latter part of June, 1877, and the one at Clark street the 24th of August following. The small shafts were completed at various times during the summer and fall. Work upon the outlet shaft and pier was begun the latter part of June, and carried forward with varying rates of progress until its completion the middle of January, 1878.

The upper part of the lake shaft is a cast iron cylinder 14 feet 2½ in. in outside diameter, and 24 feet long, cast in six annular sections of 4 feet each, with 1½ inch thickness of web. The cylinder is lined with brick masonry, making it 12 feet in internal diameter. The part of the shaft below the cylinder is also 12 feet in internal diameter. The top of the cylinder is 4½ feet below city datum.

The water is shut off from the conduit by a cover of boiler plate, fitting on to an inclined flange on the top of the shaft with a packing of India rubber between the cover and the flange. The cover projects above the water, and is provided with an opening to allow access to the shaft.

The top of the shaft is surrounded by a wooden chamber 34 feet by 18 feet inside dimensions from which gates open into the lake. The cylinder was sunk to its place November 30th, 1877.

Cleaning out the conduit was completed and an inspection made the 8th day of January, 1878, and on the 18th of the same month, the whole work having been finished, a final estimate was issued to Fitzsimons & Connell.

The total contract value of the work done by them amounts to \$320,659.53, of which \$18,769.98 was for the lake shore shaft,

and the outlet shaft, pier and house, leaving \$301,889.55 as the cost of 7536 lineal feet of the conduit including all the shafts except the two above named.

The total number of feet of conduit built is 11728, of which 4192 lineal feet were built by George F. Norris & Co.

The contract value of the work done by Norris & Co., was \$117,948.81, if it had been in a state of thorough completion; the amount paid them, under the settlement was \$156,633.15 for the work, and \$24,587.95 for their plant, (which latter sum was reserved from the amount due Fitzsimons & Connell on their contract), making a total of \$181,221.10, or \$63,272.29 more than the contract amount. The cost of cleaning the conduit built by Norris & Co., and filling the street left open by them, will, it is estimated offset any advantage derived by the city in forcing a sale of their plant to Fitzsimons & Connell.

The total cost of the conduit including every expense since its inception to the present time amounts to \$504,554.32.

The work remaining to be done to have the conduit ready for operation, is to clean the portion built by Norris & Co. of deposit and debris, the construction of the engines and boilers, the engine house, and river connection, with the necessary appurtenances. The estimated cost for doing this including payment for land is \$75,600. The balance of appropriation for this purpose, unexpended is \$77,076.75. It is very desirable that this work should be completed.

Mr. Benezette Williams has had the immediate charge of this work from the commencement of preparing plans for the letting of it to the present time.

## SECOND ANNUAL REPORT OF

### WASHINGTON STREET RIVER TUNNEL.

The effect of moisture and freezing on the brick masonry in the river portion of this tunnel has attracted attention for several years, but until last summer it was simply unsightly without being considered dangerous. The discovery then however of vertical cracks in the piers between the roadways under the river showed that it would not have been prudent to put off thorough repairs any longer. These were made with sand stone and very hard burnt brick, laid in Portland cement. To prevent leakage and frost from again injuring the masonry, sheet lead was inserted in and through the tops of the piers. Some of the piers between the south driveway and the foot-way were partially rebuilt with hard burnt brick and Portland cement. In removing the piers under the river great pains was taken to prevent any settlement of the masonry above, and with satisfactory success. These repairs cost \$5,431.

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### LA SALLE STREET TUNNEL.

The dock on the north side of the river and one of the brick arches under Kinzie street were repaired during the past year at a cost of \$441.50.

In the account given of this tunnel in the First Annual Report of this department the cost of the structure was omitted. It was, including damages, \$565,228.52.

## OUTER HARBOR.

Owing to the want of appropriations very little was done on this work during the past year. In the last annual report, a very full account of the outer harbor, obtained from the reports of U. S. Engineers in charge will be found.

Respectfully submitted,

E. S. CHESBROUGH,

*City Engineer.*

## STREET, BRIDGES AND BUILDINGS.

CHICAGO, December 31, 1877

HON. MONROE HEATH, *Mayor,**In Charge Department Public Works:*

DEAR SIR:—The second annual report of the Street Department of Department of Public Works is herewith respectfully submitted:

There has been about nine (9) miles of street paving laid during the past year, being about two (2) miles less than the previous year—done principally by private contract, under the supervision and direction of this Department; also, numerous alleys in the business part of the City paved with wooden blocks or asphalt.

Two watch and bell towers were constructed from plans and specifications prepared by this Department: One at Engine No. 3, located at 237 West Chicago avenue, and Engine No. 17, located at 80 West Lake street, under contract dated October 17, 1877, and will be completed some time in February or March, 1878, at a cost of \$1,760 for each tower constructed.

The following bridges were built under the supervision of, and from designs furnished by, this Department during the past year:

The old combination bridge at North Halsted street, built in the year 1866 by Fox & Howard, at a cost of \$7,000, was replaced by a new combination swing bridge and turntable, built by Wm. B. Howard under contract dated June 22, 1877, completed October 8, 1877, at a cost of \$4,190. The dimensions are: 140 feet on line of chord; 17 feet roadway, and 20 feet width over all.

The Fuller street bridge, which was blown down by a storm the 5th of May, 1876, and mentioned in the last report, was replaced by a new combination swing bridge and turntable, built by G. W. James, of Milwaukee, by Wm. B. Howard, Attorney contract dated May 5, 1877, completed August 4, 1877, at a cost of \$4,210. Dimensions: 127 feet on line of chord; 16.5 feet width of roadway, and 19.50 feet width over all.

The North avenue bridge, built in 1865 by N. Chapin & Co., which was in a very dangerous condition, was replaced by the construction of a new combination swing bridge and turntable, plate center pier, protection and abutments, built by Conro, Carkin & Co. under contract, dated August 28, 1877, and will be completed sometime next month at a cost of \$7,149. Dimensions are: 150 feet on line of chord, being an increase of 5 feet over the length of the old one, 17 feet width of roadway, 4 feet width of sidewalk and 29 feet width over all.

The difficulty of satisfactorily adjusting the land damages at Harrison street bridge site, spoken of in the last report, has been arranged to the satisfaction of the property owners and the City, and the contract for dredging and excavating the land condemned and the building of the new dock, on the line established by the City, was let to Conro, Carkin & Co. on the 20th day of March, 1877, and completed. The wrought iron swing bridge and turntable, with pile center and protection, abutment and approaches there-

to, was built by the American Bridge Co. at a cost of \$24,875, contract dated June 22, 1875, but, owing to the land question, was not begun until 1877, and was completed and in good order on the 23d of October, 1877. The dimensions are: 175 feet on line of chord; 19 feet roadway; 4 ft. 10 in. width of sidewalks, and 31 feet width over all.

The bridge is one of the strongest and best in the City, the materials are of good quality, and the workmanship exact and carefully executed.

For further details in regard to repairs, etc., I refer you to the report of Mr. J. K. Thompson, in charge of bridges.

MR. GEO. W. WILSON,

*Superintendent of Streets and Bridges:*

SIR.—I herewith submit my report of repairs on bridges and viaducts for the year ending December 31, 1877:

At this date all the bridges and viaducts are in fair condition. The old bridges at Fuller street, North Halsted street and North avenue having been replaced by new and substantial structures of the combination class. The floors on Clybourne place bridge and the two Division street bridges are in bad condition, and will have to be entirely relaid the coming year.

The more important repairs made during the year were a new floor on Chicago avenue bridge and the viaducts at Sixteenth and Canal streets, and at Van Buren street. The rebuilding the west approach to Chicago avenue bridge, and new approaches at North Halsted, North avenue and Fuller street bridges, and entire new capping on the protection at Throop street bridge.

Quite extensive repairs were made on Indiana street bridge and viaduct by my predecessor, Mr. Bramhall. Repairs were also made on many of the bridge protections by driving piles and strengthening with heavy oak timbers. Extensive repairs have been made on the floors of nearly all bridges and viaducts throughout the year, as occasion required.

The cost of repairs for the bridge department is as follows:

For salary of foreman in charge.....	\$1,500.00
Carpenter work and labor.....	9,264.99
Oak and pine lumber, including oak timber.....	4,245.05
Driving new piles, piles included.....	1,003.66
Iron work.....	1,091.85
Lamps and repairs on same.....	206.73
Coal.....	299.70
Rope chain and oars.....	186.81
Painting.....	495.67
Rent of lot at Erie street bridge.....	375.00
Oil.....	365.86
Hardware and tools.....	130.82
Nails and spikes.....	380.15
Brooms and matches.....	54.00
Damage to vessel.....	86.00
Advertising.....	94.58
Castings.....	71.64
Stone work.....	18.00
Repairing and cleaning clocks.....	24.25
Repairs iron work on State street bridge.....	375.00
Building dock.....	24.00
Plastering bridge houses.....	28.38
Total.....	<hr/> \$20,322.14



SECOND ANNUAL REPORT OF

I would respectfully recommend that a new turntable be placed under State street bridge the coming year, similar in character to those under our first-class bridges, as in my judgment it is necessary for the absolute safety of the bridge. The turntable now in use there is similar in construction to that under the iron bridge at Rush street, at the time it was thrown down and destroyed. Having but four main bearing wheels, which for a draw of such length is not sufficient to insure its safety under all circumstances—such as high winds and the liability of being struck by passing vessels.

I would also recommend that the center pier under Lake street bridge be rebuilt and strengthened, as the old pier is badly decayed and insufficient to sustain the weight of the bridge, it having been built about twenty years.

I would also state that nearly all the bridges and viaducts are going to decay for want of painting, which should be done the ensuing year, if the appropriations will justify the expenditure.

Respectfully submitted,

J. K. THOMPSON,  
*In Charge of Bridge Repairs.*

## STREETS.

The number of miles of improved streets in the City to date is as follows:

Wooden blocks.....	105	<del>5178</del> 5280
Cindered.....	82	<del>345</del> 5280
Graveled.....	81	<del>253</del> 5280
Macadamized.....	6	<del>245</del> 5280
Stone.....		<del>2817</del> 5280
Total.....	129	<del>1278</del> 5280

The following tables show the details regarding the streets improved during the past year, in which it will be seen that there has been laid a total of 250,740 square yards of new paving, of which nearly one-half is of cedar blocks, showing a preference by the property owners toward that kind of pavement.

My own judgment would favor the cedar block, laid upon a floor with lake shore gravel and street composition, or the genuine "Nicholson pavement" for outside streets, with "Medina stone," or its equivalent, for the heavy traveled streets.

**REPORT OF STREET IMPROVEMENTS IN THE NORTH, SOUTH AND WEST DIVISIONS FOR THE YEAR 1877.**

**SOUTH DIVISION.**

NAME OF STREET	FROM AND TO	CONTRACTOR.	COMMENCED.	FINISHED.	NATURE OF THE IMPROVEM'T.	Lin.ft.length	Sq. Yards.
Alley in blk. 2 fr. sec. 15	.....	A. H. Perkins.....	October 22, ...	November 9...	Asphalt (3 in. thick) and 6 in. cedar on sand.....	466.48	750.00
Alley N. of 20th st.	Bet. Prairie and Calumet aves	J. L. Fulton & Co.	October 18....	November 2...	Asphalt (4 in. thick).....	359.02	797.82
Alley N. of Madis'n	Bet. Wabash & Michigan aves	A. H. Perkins.....	December 10..	December 15..	6 in. cedar on 1 in. floor & comp	97.63	130.17
Alley S. of 16th st.	Bet. Michigan & Indiana aves	Ray & Whitney.....	September 25..	September 28..	" " " " " "	125.00	250.00
Couch Place.....	E. line of Franklin st. to W. line of Fifth avenue.....	Mackin & Healy.....	November 24..	December 8...	6 in. cedar on sand foundation.	322.00	644.00
*Couch Place.....	E. line of Fifth ave. to W. line of LaSalle street.....	J. B. Smith... ..	November 28..	December 2...	8 in. cedar on 1 in. floor & comp	336.00	686.84
Dearborn Place...	N. curb line of Washington to S. curb line of Randolph sts.	W. H. Watson .....	November 20..	November 27..	6 in. cedar on 3 in plank.....	418.75	1255.69
Halsted street...	S. line of Archer ave. to N. line of alley in blk 24 Bridgeport & N. line of 31st street to a line 193.1 feet S. of 38th ct.....	Mackin & Healy.....	July 31.....	December 8...	8 in. cedar on 1 in. floor and(bet and 8 in. out side of tracks 8 in. pine blocks.....	5969.20	27845.47
Jackson street...	E. rail of tracks on Fifth ave. to W. line of Clark street.....	Ray & Whitney...	August 6.....	August 15.....	canite fill.....	757.60	3828.98
Madison street...	E. line of Wabash ave. east to E. line of alley.....	A. H. Perkins.....	December 10..	December 15..	6 in. cedar on 1 in. floor, lake shore gravel and composition...	190.07	1054.44
Monroe street.....	E. line of Wabash ave. east to E. line of alley.....	J. G. McBean.....	September 24..	September 27..	6 in. pine on 1 in floor .. .	198.00	836.00
Pacific avenue.....	S. line of Harrison st.to S.rail of tracks on VanBuren st.....	Ray & Whitney.....	November 12..	December 7...	8 in. cedar on 1 in. floor, lake shore gravel and composition..	885.50	5594.34
Sixteenth street...	E. line of Michigan ave. to E. line of Indiana ave.....	Ray & Whitney.....	October 17.....	October 31.....	"Nicholson Patent," 6 in. block	407.34	1223.65
Sixteenth street...	E. line of Indiana ave. to E. curb-line of Prairie ave. . .	Ray & Whitney.....	December 7....	December 15..	" " " " "	440.00	1281.08
*University Place.	E. line of Rhodes ave to W. rail of tracks on Cot. Grove av	W. H. Watson. ....	December 13..	December 29..	6 in. pine block on 1 in. floor....	748.65	2112.41
*Vernon avenue...	North line of 29th st. to its northern terminus.....	John Duffy.....	October 28.....	November 14..	" " " " " "	192.10	768.06
Wabash avenue...	North of Congress st., being lot 9,block 10,frac'l sec.15,&c.	Ray & Whitney. ....	May 16.. ....	May 22.....	19.42ft." McDonald patent," and 58.25 ft. of 8 in pine block on 1 in. floor.....	77.67	197.15
*Wabash avenue..	Sundry lots from S. line of Congress to N. line of 22d st..	Lewis R. Dyer .....	August 15.....	September 8...	8 in. pine block on sand foundn	1353.91	3410.36
						13344.92	83006.40

**Total Miles in the South Division, 2.53:**

**NOTE--Streets marked with a star were improved under special assessment, the others by private contract between property owners and contractors, the city paying for intersections, and the contractors paying the city for engineering and superintending.**

# NORTH DIVISION.

NAME OF STREET.	FROM AND TO	CONTRACTOR.	COMMENCED,	FINISHED.	NATURE OF THE IMPROVEMENT.	Lin. ft. length	Sq. Yards.
Astor street.....	N. line of Division st. to S. line of Schiller street.....	Richard Peters.....	.....	.....	Curbing and filling.....	1298.50	.....
Clark street, N.....	S. line of Webster ave. to S. line of lot 8, lot 7, of block 31	Excelsior Stone Co. for B. Harrington..	September 11.	November 17..	6 in. pine on 1 in. floor.....	1217.36	5860.45
Clark street, N.....	S. line of Webster ave. to S. curb-line of Fullerton ave.....	J. B. Smith.....	October 2.....	November 10..	7 in. cedar on 1 in. floor. ....	1463.11	6245.99
Huron street.....	E. line of State st. to W. line of St. Clair st.....	Thomas Mackin.....	June 6.....	July 14.....	4 x 6 in. pine on 1 in. floor (exc. intersec. being 6 in. ced. on 1 in. floor	1399.56	6486.49
Halsted street, N.....	N. line of Division to N. line of Willow sts. and N. line of Willow to S. curb-line of Fullerton avenue.....	Gustav Wolff (contract for north part)	June 1.....	Unfinished ...	Curbing and filling.....	7925.00	.....
Halsted street, N.....	N. Branch of Chicago River to Division street.....	.....	May 31.....	" .....	Curb-wall and filling.....	1900.00	.....
Pine street. ....	N. line of Michigan st. S. to R. R. tracks.....	J. B. Smith.....	April 20.....	April 24 .....	6 in. cedar on sand foundation..	137.60	711.64
Pine street.....	N. line of Huron st. to N. line of Chicago avenue.....	Thomas Mackin.....	July 7.....	July 24.....	6 in. cedar on 1 in. floor.....	668.04	2627.13
Rush street .....	N. line of Chicago ave. to S. curb-line of Cedar street .....	O. Vider, intersec-tions Alek Olson.....	October 8.....	November 22..	6 in. cedar on 1 in. floor .....	2111.00	9402.00
Rush street .....	N. line of N. Water street to S. line of alley, bet. Illinois and Indiana streets.....	Alek Olson, intersec-tions A. Jalcks.....	October 29.....	November 8....	6 in. cedar on 1 in. floor.....	613.00	3262.67
State street, N.....	N. line of Kinzie street to S. line of Chicago street.....	W. H. Watson .....	June 4.....	July 12. . . .	6 in. cedar on 1 in. floor.....	1838.20	7393.95
State st. Intersect.	S. line of Illinois st. to S. curb-line of Chicago avenue. ....	Lewis R. Dyer.....	July 10.....	July 21.....	6 in. cedar on 1 in. floor.....	610.00	4211.96
Townsend street	N. line of Elm street to S. line of Division street .....	B. Harrington.....	June 18 .....	June 23 .....	4 x 6 in. hemlock on sand found	322.00	1185.56
Wells street, N.....	N. line of Division st. to intersection with Clark street..	J. B. Smith.....	June 11. ....	August 25.....	6 in. cedar on 1 in. floor.....	4493.24	19182.84
						25996.61	66570.68

Total Miles in the North Division, 4.92.

NOTE.--Streets marked with a star were improved under special assessment, the others by private contract between property owners and contractors the city paying for intersections, and the contractors paying the city for engineering and superintending.

# WEST DIVISION.

NAME OF STREET.	FROM AND TO	CONTRACTOR.	COMMENCED.	FINISHED.	NATURE OF THE IMPROVEM'T.	Lin.ft. length	Sq. Yards.
Canal street.....	Canalport ave. to Wright st.	W. H. Watson.....	May 22.....	May 25.....	6 in. pine on 1 in. floor.....	1297.50	2307.00
Canal street....	Harrison st. to Wright st.	J. G. McBean.....	May 29.....	June 29.....	8 in. pine on sand foundation...	4417.50	25667.00
Canalport avenue	Halsted st. to Canal st. (strip 16 feet wide) in centre of st.	W. H. Watson.....	May 15.....	May 21.....	6 in. pine on 1 in. floor.....	2400.00	4266.00
*Fourteenth street	Centre ave. to Stewart ave.	Lewis R. Dyer.....	July 24, 1876...	August 26, 1877	6 in. hemlock on sand founda- tion (that part W. of Jefferson st. in 1876) bal. in 1877.....	4942.00	22208.31
Harrison street..	Clinton to Canal st. (strip 27 ft.)	W. H. Watson.....	May 10.....	May 14.....	6 in. pine on 1 in. floor.....	304.00	912.00
Kinzie street.....	Canal st. to Jefferson st.	W. H. Watson.....	August 2.....	August 9.....	3 in. cedar on 1 in. floor.....	791.00	3872.27
*Lake street.....	Viaduct to Canal street.....	J. B. Smith .....	November 14..	November 23..	7 in. cedar on 1 in. floor and composition.....	246.00	1398.46
Morgan street .....	Harrison st. to Twelfth st.	Ray & Whitney.....	May 25 .....	June 25.....	6 in. pine and cedar on sand foundation, 8359 sq. yards pine	2147.00	9084.00
Morgan st. interse	Harrison st. to Twelfth st.	J. B. Smith.....	July 2.....	July 7.....	705 square yards cedar.....	168.00	1145.77
*Morgan street....	Lake st. to Randolph st.	Lewis R. Dyer.....	August 9.....	August 14.....	6 in. cedar on 1 in. floor.....	382.60	1643.54
*Polk street.....	Ogden ave. to Campbell ave.	Patrick Rierdon....	June 4.....	December 29..	MacAdam 24 ft. wide and wood- en curb.....	2682.00	.....
*Rucker street....	Chicago ave. to Milwaukee av.	J. B. Smith .....	May 29.....	June 2.....	6 in. cedar on 1 in. floor...	413.00	1862.00
Twelfth street....	Canal street to Ashland ave.	W. H. Watson.....	June 2.....	June 26.....	6 in. pine on 1 in. floor.....	7324 00	12866.00
Twelfth street. ....	(strip 16 ft. wide in centr of st)	Ray & Whitney.....	November 16..	November 20..	7 in. cedar on 1 in. floor .....	440.00	1940.00
*Twenty-second st	Bridge to Holden st.....	J. B. Smith.....	October 15....	November 9...	8 in. cedar on 1 in. floor.....	2602.00	7702.76
*Williams street...	Centre ave. to Ashland av....	J. & H. J. Duffy....	July 13 .....	July 21.....	6 in. pine on sand foundation...	616.00	1506.00
W. Water street...	Aberdeen st. to Center av....	W. H. Watson.....	August 10. ....	August 16.....	8 in. cedar on 1 in. floor .....	393.00	2051.19
	Kinzie st. to Cook st.....					31565.60	100502.30

Total No. of Miles in the West Division, 6.02.

NOTE.--Streets marked with a star were improved under special assessment, the others by private contract between property owners and contractors, the city paying for intersections, and the contractors paying the city for engineering and superintending.

In March, the contract for sweeping and cleaning the improved streets was let to C. T. Hotchkiss, for twenty and twenty-five one-hundredths (20.25) dollars, per mile. The first estimate was given for work done May 9th, 1877, and continued until the final estimate, Dec. 14th, 1877.

The following table shows the number of miles done in each Division of the city, per month.

DIVISION	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Total.
North.....	19.20	64.00	62.85	60.00	60.60	59.14	57.45	17.11	400.35
South.....	35.00	96.66	101.07	100.50	96.05	101.83	69.14	21.88	622.13
West .....	37.46	128.30	135.25	138.60	139.72	139.10	106.50	11.72	836.65
Miles per mon	91.66	288.96	299.17	299.10	296.37	300.07	233.09	50.71	1859.13

DIVISION.	MILES.	COST.
North Division.....	400.35.....	\$8,107.09
South Division.....	622.13.....	12,598.13
West Division.....	836.65.....	16,942.16

In addition to the above, the following table will give in detail the miles of street cleaning done (both improved and unimproved) cindered, macadamized, etc., by the city.

NORTH DIVISION.			SOUTH DIVISION.			WEST DIVISION			
Paved Streets cleaned,	Cindered sts. repaired,	Unimproved sts. cleaned,	Graveled and cindered sts. repaired,	Unimproved streets cleaned.	Unimproved streets graded, etc.	Cindered streets repaired.	Streets cindered.	Macadamized streets repaired,	Unimproved streets cleaned
9.66	2.25	34.09	5.87	29.98	6.97	10.00	0.64	2.00	125.00

Streets in the above table have been cleaned from one to four times each during the year, special attention having been given to the principal streets.

In addition to the above showing, all bridge and viaduct approaches have been cleaned and kept free from snow, ice, etc., and all alleys in the several divisions have been cleaned and graded, and all debris, etc., collected and removed.



Your attention is called to the following table, showing the cost of cleaning and repairing the improved streets, together with materials and cost of same.

Divisions.	Cleaning improv'd sts	Repairing streets.	Lumber.	Blocks.	Spike, nails, repairs, etc	Gravel. ;	Stone.	Cinders.	Rent of lot	Miscel.
North.....	\$8,107.09	18,745.68	1,272.97	427.87	809.57	890.80	.....	575.00	.....	40.00
South.....	12,598.18	30,822.96	3,640.20	2,172.86	681.46	11,473.75	159.85	382.00	40.00	98.50
West.....	16,942.16	54,253.93	8,043.42	2,401.72	1,091.93	326.50	754.00	262.50	162.50	211.94
Total .....	\$37,647.38	103,822.57	12,956.61	5,001.95	2,082.96	12,191.06	913.85	1,219.50	202.50	350.44

The construction of sidewalks during the past year as obtained from the Inspector's reports and not embracing sidewalks built under special assessment contract, is as follows:

NORTH DIVISION.

MATERIAL.	LINEAL FT. IN LENGTH.	LENGTH IN MILES.
Pine	58,363	.....
Stone	2,269	.....
Concrete	837	.....
	61,469	11 64-100

SOUTH DIVISION.

MATERIAL.	LINEAL FT. IN LENGTH.	LENGTH IN MILES.
Pine	26,332	.....
Stone	1,003	.....
	27,335	5 18-100

WEST DIVISION.

MATERIAL.	LINEAL FT. IN LENGTH.	LENGTH IN MILES.
Pine	64,595	.....
Stone	550	.....
Concrete	483	.....
	65,628	12 43-100

Making a Total of						
Pine sidewalk, 149,290 lineal feet, equal to 28 28-100 miles.						
Stone	"	3,822	"	"	"	72-100 "
Concrete	"	1,320	"	"	"	25,100 "
Total miles,					29.25	"

The following work has been done by carpenters under the head of repairs :

FOR WHAT USED.	NORTH DIVISION.				SOUTH DIVISION.				WEST DIVISION.			
	No. Re- p'd.	Sq. Yd's rep'd	LUMBER		Sq. yd's pav'g	LUMBER.		No. re- p'd.	Sq. yds. pav'g	LUMBER.		
			Pine	Oak		Pine	Oak			Pine	Oak	
Aprons . . . . .	163		8506			10140	1624	444		73306	3749	
Crossings, street . . . .	101		14006	5292		6930	30137	341		64028	60486	
Crossings, alley . . . .	80		5922	1569		4084		209		19796	9067	
Culverts, street . . . .	37		3462	568		6302	17860	106		40532	30565	
Culverts, alley . . . .	16		1088	348		4844	3308	48		7648	5410	
Drain boxes . . . . .	12		1144					36		6440		
Paving general repairs . .	4047				13060				27754			
Paving, Gas company . . .	220								1182 5			
sewer departm't . . . .	10				286				50			
water departm't . . . .	389				856				6504 5			
fire departm't . . . .	370								16			
street permits . . . .	908				1050				800 5			
Sidewalk, gen. repairs . .			11630			47036	700			128973		
steps . . . . .	81		4261					10		774		
railings . . . . .			1965			7204		36		1728		
intersections . . . .	131		21606	350		14446		3		400		
General repairs . . . .						30607	9523			12846	2124	
Halsted street viaduct . .											24	
bridge . . . . .										1836	222	
Indiana st. bridge appr . .										15917	1676	
Kinzie " " " " . . . .											7000	
Milwaukee ave viaduct . .										10842		
Union st approaches . . .											6700	
Wicker park, 2000 shingl. .										5126		
Harrison st. plankmg . . .						99800				12300		
Approaches, etc . . . .						20192	12048					
do S. W. Div . . . .										11380	48532	
Total . . . . .		5074	74361	8124	16130	260000	75000		36397 5	413772	186157	

Grand total for the three divisions: 58,411.50 square yards paving; 748,123 feet B. M. pine and 269,281 feet B. M. oak.

CHICAGO, January 1st, 1878.

GEO. W. WILSON, Esq., *Superintendent.*

SIR:—I herewith submit my report for street lamps, repairs of same, gas burners, &c., for the year 1877.

A considerable amount of glass was put in by the gas companies, the city in that case furnishing the glass.

At the end of the year there were 10,714 street lamps in the city, divided among the three divisions of the city as follows, to-wit:

West Division.....	5,442
South Division.....	3,104
North Division.....	2,168
<hr/>	
Total.....	10,714

Of that number some were repaired several times, so that the total number of lamps repaired during the year aggregated 16,018, making an average of 44 per day.

The number of lamps repaired with glass amounted to 14,478, leaving 1,540 on which the tin work was repaired, painted and new glass put in.

There were used for the glazing, 4,400 tin catches, and 561 boxes of glass, containing 10,323 side lights, 4,750 door lights, and 10,048 top lights, in all 25,121 lights.

During the year 351 lamps were condemned and replaced by new ones.

The cost was as follows:

Labor in glazing lamps.....	\$1,017.33
Painting and repairing tin work of 1,540 lamps.....	782.90
Cost of glass.....	1,693.10
Cost of 351 new lamps.....	1,128.00
<hr/>	
	\$4,621.33

In addition to the above, there were miscellaneous expenditures as follows, to-wit:

5 $\frac{2}{3}$ doz. glass shades for tunnels.....	28 33
--	-------

6 doz. gas burners for tunnels.....	6.00
Gas fitting in Washington street tunnel.....	1.50
16 new lamps with hanging brackets, altering gas pipes and repairing old lamps on Indiana street viaduct..	75.15
Glass for viaducts.....	12.27
Glass for Union Park lamps.....	2.66
Repairing lamps at North Side Pumping Works.....	10.00
Repairing street signs.....	6.90
Horse feed, shoeing, and repairing buggy.....	61.09
34½ gross lava tips for street lamps.....	86.25
6 gross brass pillars for street lamps.....	21.00
6 gross brass checks for street lamps.....	36.00

Respectfully submitted,

JOHN STEWART,

*Superintendent Lamp Department.*

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## HARBOR.

Owing to the unusually high water during the past year, (averaging 2.30 feet above datum) very little dredging has been required.

Respectfully submitted,

GEO. W. WILSON,

*Superintendent.*

SPECIAL ASSESSMENT DEPT.

CHICAGO, December 31st, 1877.

HON. M. HEATH, Mayor,

*In charge Department of Public Works :*

DEAR SIR:—I submit herewith a detailed statement of Special Assessments made in this Department during the past year, together with a statement of new sidewalks constructed during the same period.

STATEMENT OF ASSESSMENTS FOR WOODEN BLOCK PAVEMENT.

No. of War-rant	Name of Street.	From.	To	Amount of Assessment.
3000	Vernon ave.....	Twenty-ninth st....	its northern terminus...	\$1,198.84
3005	Twenty-second st.	(Sundry lots) Clark st...	State st.....	411.12
3024	Division st.....	Stone st.....	Lake Shore drive .....	1,813.21
3035	Milwaukee ave ..	W. Lake st.....	Fulton st .....	2,888.43
3037	Morgan st .....	(Sund'y l'ts) W Harris'n s	W. Twelfth st.....	2,322.44
3069	Canal st.....	"	Wright st.....	1,958.64
3070	W. Lake st.....	W. Lake st. viaduct....	Canal st.....	1,604.80
3073	W. 22nd st.....	Centre ave.....	Ashland avenue.....	9,711.23
3075	W. Kinzie st.....	in front of lot 24 Waba	nsia.....	362 20
3076	W. Water st.....	Sundry lots.....	.....	244.90
3081	Halsted st.....	(Sundry lots) Archer av.	Egan ave.....	20,732.81
				\$43,248.62

STATEMENT OF ASSESSMENTS FOR MEDINA BLOCK STONE  
PAVEMENT.

No. of War-rant	Name of Street.	From.	To	Amount of Assessment.
3008	Pacific ave.....	Harrison st.....	Polk st.....	\$3,223.64

**STATEMENT OF ASSESSMENTS FOR MISCELLANEOUS STREET  
AND ALLEY IMPROVEMENTS.**

No. of War-rant.	Nature of Improvem't.	Name of Street	From	To	Amount of Assessm't.
3006	Curbing and filling....	Fulton st.....	Canal st.....	Sangamon st....	\$2,810.78
3007	Macadamizing.....	W. Polk st....	Ogden ave.....	Campbell ave ..	4,745.15
3029	Curbing and filling....	Oak st.....	N. Market st....	Larrabee st.....	4,696.28
3030	".....	Ewing st.....	Canal st.....	Halsted st. ....	3,414.06
3031	Filling.....	W. Harrison st	Wood st . ....	Western ave.....	2,178.00
3034	".....	Scott st.....	N. State st.....	Lake Shore d've	1,222.19
3036	".....	W. Polk st....	Irving place ...	Western ave.....	379.85
3077	".....	W. Van Buren st	Hoyne avenue...	".....	954.92
3078	".....	Thirteenth pl..	Laflin st.....	Ashland ave.....	203.84
3079	".....	W. Thirteenth s	".....	".....	250.66
3080	".....	Hastings st ...	".....	".....	275.36
3005	".....	W. Taylor st ..	Oakley ave ....	Campbell ave....	366.71
3096	".....	Western ave...	W. Monroe st....	W. Van Buren st	263.85
					<b>\$21,770.45</b>

**STATEMENT OF ASSESSMENTS FOR STREET OPENINGS AND  
WIDENINGS.**

No. of War-rant.	Nature of Improvem't.	Name of Street	From	To	Amount of Assessm't.
3025	Opening .....	W. Washington	E. ter. W. of Cen-tral Park.....	Hamlin ave.....	\$4,292.15
3027	Opening and widen'ng	Winchester av.	W. Harrison st	W. Polk st. ...	10,283.06
3028	".....	Marshfield st..	W. Polk st.....	S. l. B. 16 assess-or's div. sec. 18	17,857.13
3041	Widening .....	Thirty-first st..	Halsted st ..	Laurel st . . . .	6,266.47
					<b>\$38,698.80</b>

**STATEMENT OF ASSESSMENTS FOR ALLEY WIDENINGS.**

No. of War-rant.	Nature of Improvem't		Amount of Assessm't.
3026	Widening .....	Alley from Blackhawk st. to N. line lot 153, Butterfield's addn.....	\$654.94

**STATEMENT OF ASSESSMENTS FOR THE ERECTION OF LAMP  
POSTS.**

No. of War-rant.	No. of Posts.	Name of Street.	From	To	Amount of Assessm't.
3032	3	W. Harrison st.....	Hermitage ave... ..	Wood st.....	\$98.00
3033	2	Elizabeth st .....	W. Madison st.....	W. Washington st ...	67.00
3038	3	Oakley ave.....	".....	W. Monroe st... ..	93.20
3039	3	Throop st.....	".....	W. Washington st ..	93.20
3040	2	W. Harrison st....	Honore st.....	Ogden ave.....	63.20
3071	8	W. Monroe st....	Irving ave.....	Western ave.....	235.20
3072	2	Ada st.....	W. Washington st.....	W. Randolph st....	93.20
3090	20	Ewing st .....	Canal st.....	Blue Island ave....	588.00
					<b>\$1,331.60</b>

## STATEMENT OF ASSESSMENTS FOR LAYING PRIVATE DRAINS.

No. of Warrant.	Name of Street.	From.	To.	Amount of Assessm't
3001	N. Clark st. ....	N. Wells st. ....	Fullerton ave. ....	\$2 821 50
3001	Hoyne ave. ....	W. Madison st. ....	W. Harrison st. ....	803 25
3007	Lincoln ave. ....	N. W. 11s st. ....	Belden ave. ....	2 006 00
				\$6,230 75

STATEMENT OF ASSESSMENTS FOR LAYING WATER SERVICE  
PIPES.

No. of Warrant.	Name of Street.	From.	To.	Amount of Assessm't.
3082	Hoyne ave. ....	W. Madison st. ....	W. Harrison st. ....	\$908.10
3082	Lincoln ave. ....	N. Wells st. ....	Belden ave. ....	2,039.40
				\$2,946 50

STATEMENT OF ASSESSMENTS FOR THE CONSTRUCTION OF  
SIDEWALKS.

No. of Warrant.	Side of St't.	Name of Street.	From.	To.	Amount of Assessm't
3002	E	Leavitt st. ....	Courtland st. ....	Hamburg st. ....	\$147 96
3003	B	Shober ..... .	North avenue .. .	its northern terminus	64 00
3004	W	Baldwin st. ....	W. Kinzie st. ....	Hubbard st. ....	95 40
3009	B	Twenty-sixth st. ....	State st. ....	Wentworth ave. ....	80 80
3010	E	Ashland ave. ....	W. Harrison st. ....	W. Twelfth st. ....	474 42
3011	S	Twenty-seventh st. ....	Stewart ave. ....	Wallace st. ....	63.12
3012	S	Douglas ave. ....	State st. ....	Indiana ave. ....	145 39
3013	B	Emerald ave. ....	Kossuth st. ....	Twenty-sixth st. ....	73 51
3014	B	Twenty-ninth st. ....	Halsted st. ....	Stewart ave. ....	263 87
3015	B	Stearns st. ....	" " " " " " " "	Madison st. ....	102 42
3016	E	Maradonia st. ....	Ellen st. ....	W. Division st. ....	72 00
3017	S	W. Jackson st. ....	Sacramento st. ....	Auburn ave. ....	60 39
3018	N	W. Van Buren st. ....	" " " " " " " "	Whipple st. ....	76 46
3019	W	Nassau st. ....	W. Jackson st. ....	W. Van Buren st. ....	27 00
3020	B	Francisco st. ....	" " " " " " " "	" " " " " " " "	177 56
3021	S	Spruce st. ....	Loomis st. ....	Lafayette st. ....	102 20
3022	W	Tompkins st. ....	W. Polk st. ....	W. Taylor st. ....	120 18
3023	W	Dudley st. ....	North ave. ....	Wabasha ave. ....	150 36
3042	B	Hastings st. ....	Blue Island ave. ....	Lafayette st. ....	46 80
3043	B	State st. ....	Twenty-ninth st. ....	Douglas ave. ....	281 20
3044	N	Thirteenth pl. ....	Wood st. ....	Lincoln st. ....	21 60
3045	B	St. Louis ave. ....	Ogden ave. ....	W. Twenty-second st. ....	143 75
3046	B	Thirteenth pl. ....	Blue Island ave. ....	Ash and ave. ....	102.26
3047	B	W. Thirteenth st. ....	" " " " " " " "	" " " " " " " "	167 72
3048	B	Thirty-eighth st. ....	S. Dearborn st. ....	M. S. R. R. ....	85 90
3049	N	Laurelton st. ....	Leavitt st. ....	Wester ave. ....	145 00
3050	S	Wabasha ave. ....	Wood st. ....	Milwaukee ave. ....	122 18
3051	S	Evergreen ave. ....	Hoyne avenue. ....	" " " " " " " "	77 00
3052	W	Sacramento st. ....	W. Madison st. ....	W. Van Buren st. ....	105 00
3053	W	Wood st. ....	Wabasha ave. ....	W. Clifton pl. ....	1 10
3054	B	Williot av. ....	Robey st. ....	Hoyne ave. ....	38 40
3055	E	Sacramento st. ....	W. Jackson st. ....	W. Van Buren st. ....	46 50
3056	N	Meaghe st. ....	Halsted st. ....	Stewart ave. ....	136 6
3057	B	Archer ave. ....	" " " " " " " "	S. Branch Chicago river	70 80
3058	S	Thirty-second st. ....	Indiana ave. ....	Prairie ave. ....	31 87
3059	E	La Salle st. ....	S. Water st. ....	Lake st. ....	113 12
3060	N	Thirty-eighth st. ....	Forest av. ....	Prairie ave. ....	38 31
3061	W	Forest ave. ....	Thirty-seventh st. ....	Thirty-eighth st. ....	27 40
3062	N	McMullen court. ....	May st. ....	Centre ave. ....	26 00
3063	B	W. Taylor st. ....	Loomis st. ....	Ashland ave. ....	118 05
3064	B	W. Polk st. ....	" " " " " " " "	" " " " " " " "	28 53
3065	B	Wood st. ....	W. Taylor st. ....	W. Twelfth st. ....	115 00
3066	N	Egan ave. ....	Cottage Grove ave. ....	Ellis ave. ....	70 40
3067	N	Thirty-seventh st. ....	" " " " " " " "	" " " " " " " "	38 96



**STATEMENT OF ASSESSMENTS FOR THE CONSTRUCTION  
OF SIDEWALKS—Continued.**

No. of Wor- k.	Side of str't.	Name of Street.	From.	To	Amount of Assessm
3066	W.	Hanover st. ....	Thirty-first st. ....	Thirty-second st. ....	35.13
3074	S.	W. Harrison st. ....	Western ave. ....	California ave. ....	118.19
3083	N.	Blackhawk st. ....	Noble st. ....	Elston ave. ....	28.18
3084	S.	Hastings st. ....	Lafin st. ....	Ashland ave. ....	24.30
3085	E.	La Salle st. ....	Montre st. ....	Jackson st. ....	52.80
3086	W.	Wood st. ....	W. Nineteenth st. ....	W. Twentieth st. ....	41.65
3087	H.	Eighteenth st. ....	Indiana ave. ....	Michigan ave. ....	113.37
3088	H.	Norton st. ....	W. Polk st. ....	Gurley st. ....	66.82
3089	E.	N. Curtis st. ....	W. Lake st. ....	Fulton st. ....	23.26
3093	B.	Quincy st. ....	La Salle st. ....	Market st. ....	172.00
3094	B.	Clark st. ....	Van Buren st. ....	Twelfth st. ....	730.63
3098	B.	W. Jackson st. ....	Lafin st. ....	Western ave. ....	317.75
3099	W.	Hobey st. ....	Birch st. ....	W. Twelfth st. ....	22.36
					<u>\$6,223.98</u>

**SUMMARY.**

Total assessments for wooden block  
pavement, including curbing and  
filling:

North Division.....	\$1,813.31	
South Division.....	22,342.77	
West Division.....	19,092.64	
	<u>          </u>	43,248.62

Total assessments for Medina block  
stone pavement:

South Division.....		3,223.64
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Total assessments for miscellaneous  
street and alley improvements:

North Division.....	5,918.47	
West Division.....	15,852.18	
	<u>          </u>	21,770.65

Total assessments for street openings  
and widenings;

South Division.....	6,266.47	
West Division.....	32,432.33	
	<u>          </u>	38,698.80

**Total assessment for alley widenings;**

North Division.....		654.94
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**Total assessments for erection of lamp-posts:**

West Division.....		1,331.60
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**Total assessments for laying private drains:**

North Division.....	5,487.50	
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West Division.....	803.25	
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	<hr/>	6,290.75
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**Total assessments for laying water service pipes:**

North Division.....	2,038.40	
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West Division.....	908.10	
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	<hr/>	2,946.50
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**Total assessments for constructing sidewalks:**

South Division.....	2,563.39	
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West Division.....	3,770.59	
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	<hr/>	6,333.98
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**Total amount of assessments for North, South and West Divisions**

		124,499.48
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**To be paid from appropriation fund in the**

North Division.....	3,338.02	
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South Division.....	639.34	
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West Division.....	7,515.79	
--------------------	----------	--

	<hr/>	11,493.15
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**Total estimated cost of all improvements in North, South and West Divisions .....**

		135,992.63
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## SECOND ANNUAL REPORT OF

Total number of lamp posts provided  
for by assessment :

### NORTH DIVISION.

From January 1, 1877, to January 1, 1878.....	34
Posts erected prior to January 1, 1877.	<u>2,124</u>

### SOUTH DIVISION.

From January 1, 1877, to January 1, 1878.....	47
Posts erected prior to January 1, 1877.	<u>3,046</u>

### WEST DIVISION.

From January 1, 1877, to January 1, 1878.....	77
Posts erected prior to January 1, 1877.	<u>5,291</u>

Total number of posts in the city pro- vided for by special assessment...	104
In addition to the above, there are bridge and viaduct lamp-posts not provided for by special assessment, which makes the total number of lamp-posts in the city.....	107

## SUMMARY.

The improvements made during the past year, in addition to those previously reported, gives the following:

## RECAPITULATION.

559,578 lineal feet wooden block pavement, equal to	$105\frac{5178}{5280}$	miles
44,585 lineal feet of cindering, equal to.....	$8\frac{2845}{5280}$	"
43,493 lineal feet of graveling, equal to.....	$8\frac{1253}{5280}$	"
31,925 lineal feet of macadamizing, equal to.....	$6\frac{245}{5280}$	"
2,817 lineal feet of stone pavement, equal to....	$\frac{2817}{5280}$	"

Total number of miles improved in the city..  $129\frac{1278}{5280}$  miles

These improvements are distributed in the three divisions of the city as follows:

## NORTH DIVISION.

124,739 lineal feet of wooden block pavem't, equal to	$23\frac{8299}{5280}$	miles
5,044 lineal feet of cindering, equal to.....	$\frac{5044}{5280}$	"
1,604 lineal feet of graveling, equal to.....	$\frac{1604}{5280}$	"
3,049 lineal feet of macadamizing, equal to.....	$\frac{3049}{5280}$	"
908 lineal feet of stone pavement, equal to....	$\frac{908}{5280}$	"

Total number of miles improved in the North Div.  $25\frac{8844}{5280}$  "

## SOUTH DIVISION.

187,004 lineal ft. of wooden block pavement, equal to	$35\frac{2204}{5280}$	miles
27,969 lineal feet of graveling, equal to.....	$5\frac{1569}{5280}$	"
10,291 lineal feet of macadamizing, equal to.....	$1\frac{5011}{5280}$	"
1,909 lineal feet of stone pavement, equal to...	$\frac{1909}{5280}$	"

Total number of miles improved in the South Div.  $43\frac{183}{5280}$  "

## WEST DIVISION.

247,835 lineal ft. of wooden block pavement, equal to	46 $\frac{4}{5}$ $\frac{2}{5}$ $\frac{5}{8}$ miles
39,541 lineal feet of cindering, equal to . . . . .	7 $\frac{2}{5}$ $\frac{5}{8}$ "
13,920 lineal feet of graveling, equal to. . . . .	2 $\frac{2}{5}$ $\frac{5}{8}$ "
18,585 lineal feet of macadamizing, equal to. . . . .	3 $\frac{2}{5}$ $\frac{5}{8}$ "
Total number of miles improved in the West Div.	60 $\frac{4}{5}$ $\frac{2}{5}$ $\frac{5}{8}$ "

The following is a list showing the total of assessments made in each year since 1861.

For the year ending April 1, 1862 . . . . .	\$42,635.49
For the year ending April 1, 1863 . . . . .	46,493.67
For the year ending April 1, 1864 . . . . .	389,169.31
For the year ending April 1, 1865 . . . . .	103,576.35
For the year ending April 1, 1866 . . . . .	802,574.56
For the year ending April 1, 1867 . . . . .	317,206.18
For the year ending April 1, 1868 . . . . .	1,354,436.48
For the year ending April 1, 1869 . . . . .	2,395,683.03
For the year ending April 1, 1870 . . . . .	2,836,852.48
For the year ending April 1, 1871 . . . . .	2,359,835.89
For the year ending April 1, 1872 . . . . .	62,222.25
For the year ending April 1, 1873 . . . . .	
For the year ending April 1, 1874 . . . . .	749,460.27
For the year ending April 1, 1875 . . . . .	723,254.42
For the nine months ending January 1, 1876 . . . . .	60,585.72
For the year ending January 1, 1877 . . . . .	1,516,081.07
For the year ending January 1, 1878 . . . . .	124,498.48
Total for seventeen years . . . . .	\$13,884,566.65

## SIDEWALKS.

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During the past year the following new sidewalks have been constructed.

Stone.....	3,822 feet.
Concrete.....	1,320 feet.
Plank.....	156,503 feet.

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Total..... 161,645 feet.

Or,  $30\frac{324}{520}$  miles.

This, in addition to walks heretofore built, makes a total of  $703\frac{97}{520}$  miles of sidewalk in the city.

Respectfully submitted,

H. J. JONES,

*In Charge of Special Assessments.*

# FINANCIAL STATEMENT

TO THE HON. MONROE HEATH, *Mayor,*

*And in Charge of the Department of Public Works,*

DEAR SIR.—I herewith respectfully submit my report of the receipts and expenditures by the Department of Public Works from January 1st, 1877, to December 31st, 1877, inclusive.

## TRIAL BALANCE LEDGER, DEPARTMENT OF PUBLIC WORKS, DECEMBER 30, 1877.

	DR.	CR.
Water Works .....	\$6,058,061.75	
"    "    Income .....		\$8,467,973.64
Water Fund in hands of City Treasurer .....	116,167.13	
General Taxes 1874 and 5.....		430,000.00
Water Loan Bonds 6 per cent..		742,000.00
"    "    "    7 per cent..		3,660,000.00
"    "    "    Cancelled..		261,000.00
Water Loan Interest... ..	3,425,987.61	
Water Works, expense and re- pairs .....	3,776,591.28	
Duncan, Sherman & Co.....	16,065.00	
Water Works, coal account....		584.89
American Exchange Nat'l Bank	135,074 07	
Water service cocks.....	3,793.69	
E. M. Johnson.....	500.00	
Amount carried forward ....	\$13,532,240.53	13,561,558.53

	DR.	CR.
Amount brought forward . . . .	\$13,532,240.53	13,561,558.53
Water tax fund in hands of City Treasurer . . . . .	93,659.85	
Certificates of Indebtedness . . . .		14.50
Stock account, Water . . . . .	29,318.00	
A. B. Miner and A. C. Reed . .		4,000.00
Ogden, Sheldon & Co . . . . .		2,767.43
Burnett, Todd & Cochran . . . .		250.00
John Tyrell . . . . .		150.00
Wm. Grayden . . . . .		250.00
D. Kreigh & Co . . . . .		711.92
S. J. Bushnell . . . . .		250.00
I. R. Hitt . . . . .		25.00
E. E. Howard . . . . .		100.00
Thos. Parker . . . . .		150.00
A. P. Down & Co . . . . .		50.00
D. R. Dyche . . . . .		50.00
O. S. Hinds . . . . .		175.00
S. L. Brown . . . . .		50.00
J. B. Drake . . . . .		150.00
J. A. Hamilton & E. N. Taylor		4,248 63
W. Little . . . . .		100.00
Rathbom, Sard & Co. . . . .		300.00
J. B. Hobbs . . . . .		100.00
Fuller, Warren & Co . . . . .		250.00
David Kreigh . . . . .		250.00
C. J. L. Meyers . . . . .		200.00
E. H. Castle . . . . .		150.00
The Peshtigo Co . . . . .		300.00
Chicago Canal and Dock Co . .		1,166.43
Siamey Myers . . . . .		250.00
Chicago & N. W. R. R . . . . .		10,000.00
Amount carried forward . . . .	\$13,655,218.38	13,588,017.44



	DR.	CR.
Amount brought forward....	\$13,655,218.38	13,588,017.44
Water pipe account.....	23,962.74	
Water works.....	2,286,288.33	
General taxes, Water tax.....		2,377,452.01
Sewerage fund in hands of City Treasurer.....	271,208.54	
Sewerage sinking fund.....		68,841.55
Sewerage sinking fund in hands City Treasurer.....	55,588.16	
Sewerage loan interest.....		19,883.07
American Exchange Nat'l Bank Certificates of indebtedness....	90,646.92	356,728.00
Stock account.....	1,632.44	
Rebates on sewerage taxes....	40,950.90	
Galena & Chicago R. R. Co....		382.55
Chicago, Burlington & Quincy R. R. ....		6,744.01
House drains.....		7,447.78
Sewerage tax fund in hands of City Treasurer.....	616,685.66	
Sewers, North Division.....	1,013,429.12	
“ South “.....	1,373,228.20	
“ West “.....	2,564,419.87	
Sewerage loan bonds 6 per cent.		87,000.00
“ “ “ 7 per cent.		2,550,000.00
“ “ “ cancelled.		363,000.00
Certificates of indebtedness....		98,243.87
Covers account.....	4,938.54	
Pipe account.....	1,409.43	
Brick account.....	16.12	
Cement account.....	128.75	
General Taxes.....		2,366,632.76
S. Lind, Treasurer.....	109,245.48	
Amount carried forward.....	<u>\$22,108,997.58</u>	<u>21,890,373.04</u>

	DR.	CR.
Amount brought forward . . . .	\$22,108,997.58	21,890,373.04
D. Coughlin . . . . .	1,561.51	
B. McMahon . . . . .		200.00
O. B. Heaton . . . . .		428.75
E. N. Taylor & J. A. Hamilton		15,596.77
A. Jacobson and P. Tallman . . .		2,000.00
A. Jacobson . . . . .		2,000.00
C. A. Gregory . . . . .		4,000.00
R. DeBaptiste . . . . .		15.00
F. Kneeland . . . . .		31.25
H. Greenebaum, Treasurer . . . .		4,500.00
A. M. Ferrier . . . . .		240.00
A. A. Dewey . . . . .		235.00
N. DeGolyer . . . . .		280.00
N. C. Horse R. R. Co. . . . .		752.00
C. B. Farwell . . . . .		265.30
J. E. Aweley . . . . .		264.00
E. Gaylord . . . . .		730.50
C. W. Rigdon . . . . .		1,732.50
G. E. Adams . . . . .		205 63
E. S. Dreyer . . . . .		530.56
S. W. Rawson . . . . .		659.30
Daniel Lane . . . . .		608.33
J. A. Blomgreen . . . . .		133.25
J. M. Johnson . . . . .		133.25
Z. Rosenlof . . . . .		133.25
L. Wrick . . . . .		133.25
Amount carried forward . . . .	\$22,110,559 09	21,926,180.93

	DR.	CR.
Amount brought forward....	\$22,110,559.09	21,926,180.93
Ward 6.....		25,504.68
Ward 5.....		17,783.33
Ward 14.....		31,236.28
Ward 8.....		1,488.78
Ward 12.....		35,125.18
Ward 13.....		2,413.75
Ward 15.....		1,097.94
Ward 7.....		4,713.76
Ward 11.....		9,803.97
Ward 4.....		39,575.10
Ward 16.....		5,589.89
Ward 17.....		111.87
Ward 3.....		3,120.00
Interest on Revenue Warrants.		6,813.63
Appropriation Fund in hands of City Treasurer.....	602,996.29	
North Division.....		11,485.01
South Division.....		161.27
West Division.....		7,175.01
Special Assessments.....		317.33
City office expense.....		175.30
Public Buildings.....		3,437.47
Union Square.....		300.00
Washington Park.....		218.90
Ellis Park.....		384.93
Dearborn Park.....		500.00
Lake Park.....		1,107.22
Union Park.....		540.03
Jefferson Park.....		401.89
Vernon Park.....		23.61
Amount carried forward....	\$22,713,555.38	22,136,787.06

	Dr.	Cr.
Amount brought forward....	\$22,713,555.38	22,136,787.06
Wicker Park.....		406.12
Washington street tunnel.....	3,337.22	
La Salle street tunnel.....		1,605.93
Street signs.....	9.90	
Public hydrants.....		193.56
F. J. Reed, Cashier.....	308.12	
Warrant No. 480.....		308.12
City proportional expense.....		637.41
Public benefits.....		40,811.55
Street lamps.....	309.44	
Land damages at Harrison street bridge.....		20,844.43
Chicago harbor.....		8,435 57
Bridge tenders' salaries.....		752.75
Bridge department.....		4,860.96
Harrison street bridge.....		12,250.00
North avenue bridge.....		17,032.78
Thirty-ninth street bridge.....		500.00
Fuller street bridge.....		790.00
N. Halsted street bridge.....		810.00
Permits.....		1,861.68
Twelfth street viaduct.....		3,267.58
Halsted street viaduct.....	8,612.96	
Eighteenth street viaduct.....		25,000.00
Indiana street viaduct.....		2,468.00
Milwaukee avenue viaduct.....		9,106.98
Blue Island avenue viaduct.....		5,849.05
Cleaning North Branch.....		116,362.97
Bathing houses.....		4,000.00
Certificates of Indebtedness....		223,414.95
Amount carried forward....	\$22,726,133.02	22,638,357.45

# SECOND ANNUAL REPORT OF

	Dr.	Cr.
Amount brought forward....	\$22,726,133.02	22,638
Interest on Certificates of Indebtedness.....	123,702.70	
House numbers.....	21.08	
Ogden ditch dam.....		
Surplus fund.....		211,2
City hall fund appropriation....		25,0
City hall miscellaneous expense.	4,940.23	
City hall fund in hands of City Treasurer.....	879.19	
McKinney & Doyle.....	3,600.00	
John Sackley.....	1,483.62	
Mortimer & Tapper.....	14,096.96	
American Exchange National Bank, River.....	90,031.20	
River improvement loan interest.		123,713
River improvement sinking fund.		51,327
River improvement sinking fund in hands of City Treasurer..	51,327.08	
River improvement bonds, 7 per cent.....		2,621,000
River improvement bonds, cancelled.....		379,000
River improvement certificate of indebtedness.....		272,976
Cost of Deepening Illinois and Michigan canal.....	3,306,658.89	
City Bridewell fund in hands of City Treasurer.....	11,377.17	
City Bridewell bonds.....		385,000
Cost of City Bridewell.....	373,622.83	
	<u>\$26,707,873.97</u>	<u>\$26,707,873.97</u>

## WATER FUND.

STATEMENT of the receipts by the Department of Public Works, from January 1st, 1877 to December 31st, 1877, inclusive, and detailed statement of expenditures during the same time.

## RECEIPTS.

Received from Water Tax collected .....	\$908,500.64	
Received from sale of 250 water bonds .....	262,125.00	
Received from revenue warrants	129,000.00	
Received for tapping pipes.....	6,068.58	
Received for letting on water...	2,321.83	
Received for setting water meters	3,912.51	
Received for labor and material.	14,889.98	
Received for over remittance on bonds in 1874 .....	1,000.00	
Received for deductions on gas bills .....	620.10	
Received for vouchers cancelled.	236.87	
	<hr/>	
Total receipts .....		1,328,675.51

## EXPENDITURES.

## ADDITION TO WATER WORKS.

DISTRIBUTING PIPES AND  
SUPPLY MAINS LAID.

	Cash Payments.	True Cost.
For cast iron water pipe. \$34,503.65		
Labor laying pipe..... 32,763.32		
For new hydrants and stop cocks..... 13,436.06		
	<hr/>	<hr/>
Amount carried forward \$80,703.03		

Cash Payments.

Amount brought forward \$80,703.03

Brick used..... 3,517.27

Lead used..... 4,875.30

Special castings..... 6,956.73

Cement used..... 1,558.14

Lumber used..... 1,958.03

Rebates on advances for

laying pipe..... 817.10

Powder, ..... 126.50

Teaming..... 116.10

Sewer pipe..... 263.27

Gasket..... 224.82

Hardware..... 479.38

Sand ..... 332.12

Saw dust..... 37.50

Repairing wagon..... 50.00

Plumbing ..... 47.48

Horse cover..... 5.00

Horse feed..... 275.22

Oil ..... 33.65

Advertising ..... 65.00

Pails..... 8.50

Rent of barn..... 48.00

Hose..... 9.70

\$102,507.84

ADD—

For laying pipe for which

money was advanced 2,902.57

DEDUCT—

Amount received for la-

bor and material.... \$14,898.98

11,996.41

905

Amount carried forward.

\$102,507.84

905

	Cash Payments.	True Cost
Amount brought forward	\$102,507.84	90,511.43

**WATER WORKS, NEW ENGINE.**

Paid Murphy and Co.,

Contractors.....\$60,333.22

Paid for testing engines. 3,096.90

Paid for new valves.... 452.71

Paid for use of scale.... 22.85

63,905.68

63,905.68

**NEW LAKE TUNNEL.**

Paid Steel and McMahon

in full..... ..

1,000.00

1,000.00

**NEW PUMPING WORKS.**

Testing engines..... \$5,392.22

Castings ..... 2,093.14

Stop cocks..... 1,470.00

Clean Boiler..... 300.00

Iron work..... 386.03

Carpentry work..... 144.08

Hardware..... 8.67

Lamps..... 31.00

Blinds..... 63.00

9,888.14

**DEDUCT—**

Amount received for

voucher canceled... 113.76

9,774.38

Total additions to water

works .....

\$177,301.66

\$165,191.49



## WORKING EXPENSES AND REPAIRS.

Cash Payments.

True Cost.

NORTH PUMPING WORKS  
AND SHOPS.For 11290<sup>1170</sup>/<sub>2000</sub> tons of

coal .....	\$59,964.39		
Labor .....	29,935.65		
Spiral castings.....	7,536.42		
Repairing roof.....	1,090.70		
Gas used.....	1,191.61		
Packing.....	428.82		
Lumber.....	425.83		
One pump.....	438.00		
Lead .....	342.44		
Iron and bolts.....	823.65		
Oil .....	896.52		
Repairing boiler.....	463.10		
Packing.....	245.41		
Hardware.....	234.68		
Two telegraph printers..	345.00		
Telegraph material.....	135.54		
Soft coal.....	145.76		
Brick .....	180.00		
Waste .....	147.10		
Horse feed.....	172.71		
Painting roof.....	134.00		
Stone coping.....	111.72		
Boiler furnace.....	129.00		
Powder .....	38.40		
Horse shoeing.....	41.63		
Steel.....	37.47		

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Amount carried forward 105,635.55

	Cash Payments.	True Cost.
Amount brought forward	\$105,635.55	
Brooms and soap . . . . .	25.10	
Plumbing . . . . .	26.66	
Window shades . . . . .	16.22	
One steam counter . . . . .	54.00	
Painting fence . . . . .	65.00	
Lime and Cement . . . . .	89.61	
Gasket . . . . .	97.95	
Stone posts . . . . .	51.32	
Repairing harness . . . . .	5.60	
Repairing roof . . . . .	37.44	
Ice . . . . .	7.64	
Water cooler . . . . .	19.20	
Glass . . . . .	14.14	
	<u>\$106,145.43</u>	
ADD—		
For coal used previously		
paid for . . . . .	\$ 808.01	
DEDUCT—		
Amount received for mak-		
ing hydrants and stop-		
cocks at shops . . . . .	13,572.92	
Amount received for labor	12.83	
Amount received for sta-		
ble expenses . . . . .	302.34	
Amount received for tap-		
pers' tools . . . . .	44.36	
Amount received for labor		
at shops . . . . .	1,222.89	
	<u>\$15,155.34</u>	
Less as above . . . . .	808.01	
	<u>\$14,347.33</u>	
Amount carried forward.	<u>\$106,145.43</u>	<u>\$91,798.10</u>
		91,798.10

		Cash Payments.	
Amount brought forward.		\$106,145 43	5
WEST PUMPING WORKS.			
Coal used.....	\$20,727.05		
Labor.....	20,485.83		
Gas.....	1,750.30		
Steam fitting and iron works.....	1,452.28		
Oil.....	1,921.74		
Dredging slip.....	1,216.66		
Building dock.....	497.92		
Taxes.....	100.70		
One telegraph printer....	289.50		
Telegraph material.....	263.99		
Rubber valves.....	443.94		
Repairing engines.....	749.20		
Hardware.....	259.90		
Driving piles.....	100.00		
Roofing.....	108.59		
Repairing boilers .....	641.64		
Stone work.....	273.36		
Lumber.....	682.22		
Waste.....	155.67		
Castings.....	435.75		
Compound.....	255.00		
Brick and Cement.....	580.57		
Furnace Tile.....	302.42		
Packing.....	589.84		
Steam guages.....	146.61		
Two lubricators.....	70.00		
Sand.....	24.50		
Use tug.....	73.80		
Amount carried forward.	\$54,598.98	106,145.43	91

		Cash Payments.	True Cost.
Amount brought forward	\$54,598.98	106,145.43	91,798.10
Matches and soap... ..	52.80		
Painting and glazing....	67.41		
Smoke consumers.....	30.70		
One cart.....	25.00		
Lead.....	21.00		
Brooms.....	27.25		
Bedding.....	35.82		
Rope and blocks.....	94.19		
Ice.....	10.25		
Gong bell.....	17.90		
Pails.....	26.60		
Mats.....	33.51		
	<u>          </u>	\$55,041.41	
DEDUCT—			
Amount received for de-			
ductions in gas bills..	\$620 10		
Amount received for			
voucher cancelled....	44.72		
	<u>          </u>		
	\$664.82		\$54,376.59

## OFFICE EXPENSE AND SALARIES.

$\frac{1}{3}$ salary of city engineer.	\$1,166.66		
$\frac{1}{3}$ salary of secretary....	666.66		
$\frac{1}{3}$ salary of superintendent	800.00		
$\frac{1}{3}$ salary of bookkeeper..	733.33		
$\frac{1}{3}$ salary of assistant book-			
keeper.....	466.66		
$\frac{1}{3}$ salary engineer's clerk.	400.00		
$\frac{1}{3}$ salary of superintend-			
ent's clerk.....	466.67		
	<u>          </u>	<u>          </u>	<u>          </u>
Amount carried forward	\$4,699.98	161,186.84	146,174.69

		Cash Payments.	True Cost.
Amount brought forward.	\$4,699.98	161,186.84	146,174.69
Salary of chief clerk water office.....	1,800.00		
Salary of cashier water office.....	1,600.00		
Salary of four division clerks.....	4,800.00		
Salary of two assistant division clerks.....	1,800.00		
Salary of six collectors..	5,400.00		
Salary of water assessor.	1,600.00		
Salary of assistant water assessor.....	1,200.00		
Salary of draughtsman..	1,000.00		
Salary of permit clerk...	1,000.00		
Salary of meter clerk...	1,200.00		
Salary of office clerk....	228.14		
Printing and stationery..	1,302.19		
Gas.....	368.44		
Coal.....	628.59		
Engraving.....	405.35		
Advertising.....	357.36		
Sprinkling.....	155.00		
Plumbing.....	44.90		
Ice.....	73.34		
Plastering.....	35.58		
Lumber.....	92.80		
Account 1st annual re- port.....	66.66		
Steam fitting.....	43.64		
Hardware.....	91.17		
Carpet.....	26.45		
Amount carried forward	\$30,019.59	161,186.84	146,174.69

		Cash Payments.	True Cost.
Amount brought forward	\$30,019.59	161,186.84	146,174.69
One map.....	12.00		
Oil.....	6.00		
Soap... ..	7.20		
Brooms.....	9.33		
	<hr/>	\$30,054.12	
Deduct amount received for vouchers cancelled.	56.56		29,997.56

## WATER METERS.

New meters put in use...	\$8,430.20		
Labor .....	7,223.00		
Castings .....	2,386.35		
Plumbing .....	187.50		
Freight .....	203.52		
Horse feed .....	108.26		
Lumber.....	411.42		
Two wagons.. ..	400.00		
Hardware.....	208.95		
Counters .....	139.50		
Repairing harness.....	12.00		
Sawdust .....	62.50		
Bolts.....	18.90		
Packing.....	32.07		
Plumbing.....	55.42		
Matches. ....	17 88		
Candles.....	38.31		
Repairing wagon.....	20.05		
Horse shoeing.....	43.65		
Brick .....	12.00		
Valves .....	38.00		
	<hr/>	\$20,049.48	
Amount carried forward.		\$211,290.44	176,172.25

	Cash Payments.	True Cost
Amount brought forward.	\$211,290.44	176,172.25
ADD—		
For stable expenses at pump works.....	53.94	
For labor at shop in 1877.	124.99	
	<hr/>	
	\$178.93	
DEDUCT—		
Amount rec'd for labor and material.....	3,912.51	
	<hr/>	
	\$3,733.58	16,315.90

REPAIRS OF PIPES, HY-  
DRANTS, STOP COCKS,  
AND MISCELLANEOUS OP-  
ERATING EXPENSES.

Labor.....	\$61,983.74		
Lumber.....	2,108.77		
Two boilers .....	273.20		
Repairing wagon.....	140.70		
Sawdust.....	294.75		
Oil.....	132.73		
Castings.....	135.44		
Cement .....	751.80		
Plumbing ...	172.79		
Hardware and tools.....	149.10		
Horse feed .....	104.05		
Damages.....	50.00		
Harness and repairs.....	89.55		
Rent barn.....	24.00		
Horse shoeing .....	59.18		
	<hr/>		
Amount carried forward	\$66,469.80	211,290.44	192,488.15

	Cash Payments.	True cost.
Amount brought forward	\$66,469.80	192,488.15
Lead.....	2.19	
Pitch.....	16.25	
Packing.....	11.70	
Coal.....	4.60	
Hose.....	6.15	
Transfer to Water Tax		
Fund .....	141,690.77	
Sand.....	52.37	
	<u>          </u>	
	\$208,253.83	
ADD—		
For 22 Bonds purchased		
and cancelled.....	22,000.00	
For labor at shops in 1877	906.77	
	<u>          </u>	
	\$22,906.77	
DEDUCT—		
Amount received for let-		
ting on water.....	2,321.83	
	<u>          </u>	
	\$20,584.94	
		228,838.77

## LAKE TUNNEL CRIB.

Labor.....	\$5,878.88		
Paid for diving.....	4,554.00		
Use of tug .....	2,083.55		
Cement.....	1,192.89		
Iron plates.....	285.95		
Examining crib .....	200.00		
Boiler.....	351.00		
One steam pump.....	325.00		
	<u>          </u>		
Amount carried forward	\$14,781.27	419,544.27	421,326.92



		Cash Payment.	True Cost.
Amount brought forward	\$14,871.27	419,544.27	421,326 92
Coal.....	151.50		
Hardware.....	294.54		
Steel plates.....	496.80		
Steam fitting.....	380 07		
Iron work.....	310.99		
Roofing.....	276.32		
Groceries and provisions..	130.12		
Repairing striking machine.....	116.00		
Lumber.....	391.24		
Brick.....	558.00		
Castings.....	278.05		
Damage to crib-keeper's clothing.....	100.00		
Sand.....	47.80		
Lamps, oil.....	87.22		
Rubber boots.....	27.00		
Lead.....	16.27		
Fire arms.....	49.35		
Bedding.....	30.00		
Rope.....	68.60		
Brooms.....	6.83		
Pails.....	3.70		
Advertising.....	56.84		
Crockery.....	13.33		
	<hr/>	\$18,761.84	
ADD—			
For labor at shops in 1877	191.13		18,952.97
Total operating expenses.		<hr/> \$438,306.11	<hr/> \$440,279.89

## WATER LOAN INTEREST.

	Cash Payments.	True Cost.
Remittance to American Exchange Nat'l Bank to pay July, '77, int. . . . .	142,074.30	
Remittance to American Exchange Nat'l Bank to pay Jan'y, '78, int. . . . .	134,485.37	
Coupons paid by City Treasurer . . . . .	34,630 00	
Interest paid on Revenue Warrants . . . . .	24,514.34	
	<u>335,704.01</u>	
DEDUCT—		
Amount rec'd for interest.	70	\$335,703.41

## WATER MISCELLANEOUS EXPENSE.

## WATER SERVICE COCKS.

	Cash Payments.	True Cost.
Labor tapping pipes . . . . .	\$5,096.00	
Salary of clerk . . . . .	999.96	
Taps . . . . .	498.30	
Water boxes . . . . .	193.83	
One horse . . . . .	110.00	
One wagon . . . . .	125.00	
Shoeing horses . . . . .	156.00	
Horse feed . . . . .	218.75	
Repairing wagons and harness . . . . .	155.76	
	<u>\$7,553.60</u>	
Amount carried forward.		\$7,553.60

	Cash Payments.	True Cost.
Amount brought forward.	\$7,553.60	
ADD—		
For stable expenses at pump works.....	\$248.40	
For tappers' tools made at shops.....	44.36	
	<u>\$292.76</u>	
DEDUCT—		
Amount received for tap- ping.....	6,068.58	
	<u>\$5,775.82</u>	\$1,777.78 .
 WATER WORKS INCOME.		
Water tax overpaid re- funded.....	\$102.98	\$102.98 .
 WATER LOAN BONDS 6 PER CENT.		
Remittance to pay 271 bonds, due July 1st, 1877.....	\$271,000.00	
1 bond paid by city treasurer.....	1,000.00	
Remittance to pay 152 bonds, due January 1, 1878.....	152,000.00	
	<u>\$424,000.00</u>	
 CERTIFICATES OF INDEBT- EDNESS.		
Revenue warrants paid..	\$419,717.34	
Amount carried forward	<u>\$851,373.92</u>	<u>1,880.76</u>

	Cash Payments.	True Cost.
Amount brought forward.	\$851,373.92	1,880.76
PRIVATE ADVANCES FOR		
LAYING WATER PIPE.		
Paid F. E. Canda & Co..	\$1,342.66	
Paid G. A. Seaverns....	1,856.59	
Paid C. H. McCormick & Bro.....	5,210.49	
Paid W. D. Kerfoot....	634.23	
Paid A. M. Jones.....	61.31	
Paid R. L. Root.....	67.54	
Paid F. S. Biard.....	15.00	
Paid S. C. Hayes.....	25.00	
Paid Potwin & Corby...	113.01	
	<hr/>	
	\$9,325.83	\$9,325.83
Paid Jos. Eastman, laying pipe.....	410.89	410.89
	<hr/>	<hr/>
Total miscellaneous..	\$861,110.64	\$11,617.48
Total additions to water works brought for- ward.....	177,301.66	165,191.49
Total operating expenses brought forward....	438,306.11	440,279.89
Total water loan interest	335,704.01	335,703.41
	<hr/>	<hr/>
Total expenditures...	\$1,812,422.42	\$952,792.27

NOTE—Of the above cash payments \$424 000.<sup>00</sup> was for payment of bonds falling due, and \$141,690<sup>11</sup> was a transfer from Water Fund to Water Tax Fund, and \$419,717.<sup>84</sup> was for Time Revenue Warrants paid, all being cash transactions but no expense to the city.

## SECOND ANNUAL REPORT OF

### SEWERAGE FUND.

STATEMENT of receipts by the Department of Public and detailed statement of expenditures from January 1st to December 31st, 1877, inclusive.

#### RECEIPTS.

Amount of appropriation for 1877.	\$469,676.49
Received from revenue warrants.	598,809.00
Received from indebtedness fund.	10,000.00
Received from house drain permits	9,760.25
Received from labor and material.	519.25
Received from voucher cancelled.	11.37
Total receipts.....	\$1,088,771.00

#### EXPENDITURES.

Cash Payment True Co

#### SEWERAGE OFFICE EXPENSE.

1/3 Salary of City Engineer	\$1,166.67
1/3 " " Secretary . .	666.66
1/3 " " Superintend't	800.00
1/3 " " Bookkeeper .	766.67
1/3 " " Ass't " .	466.66
1/3 " " Engineer's clerk.....	400.00
Amount paid for draughting....	216.58
Printing and stationery ..	780.27
Advertising.....	389.07
Amount carried forward	\$5,652.58

		Cash Payments.	True Cost.
Amount brought forward	\$5,652.58		
Miscellaneous cash items,			
paid by Cashier. . . . .	337.28		
Engraving. . . . .	161.67		
On account of First Annual			
Report. . . . .	66.67		
Labor. . . . .	66.08		
One map. . . . .	12.00		
Binding Permit books. . . .	36.00		
Hardware . . . . .	8.75		
	<hr/>	\$6,341.03	
DEDUCT—			
Amount received for vou-			
chers cancelled . . . . .	\$11.37		\$6,329.66
	<hr/>		

REPAIRS SEWERS NORTH  
DIVISION.

Labor . . . . .	\$1,968.13		
Cement. . . . .	296.66		
Brick. . . . .	176.00		
Covers . . . . .	350.69		
Sand. . . . .	16.43		
Keeping horse. . . . .	26.49		
	<hr/>	\$2,834.40	
ADD—			
For depreciation in tools. .	\$40 19		2,874.59

REPAIRS SEWERS SOUTH  
DIVISION.

Labor. . . . .	\$2,079.49		
Cement used. . . . .	200.62		
	<hr/>		
Amount carried forward	\$2,280.11	9,175 43	9,204.25

	Cash Payments.	
Amount brought forward. \$2,280.11	9,175.43	9
Brick used..... .. 212.42		
Covers used ..... 385.76		
Sand used..... 30.22		
Keeping horse ..... 26.48		
	2,934.99	
ADD—		
For depreciation in tools.. \$40.19		
		2,9

REPAIRS SEWERS WEST  
DIVISION.

Labor..... \$2,507.93		
Cement used..... 361.14		
Brick used..... 425.53		
Covers used ..... 490.97		
Sand used..... 24.95		
Keeping horse ..... 26.48		
Lumber..... 6.00		
Plumbing..... .1.30		
Oil..... 75		
	3,845.05	
ADD—		
For depreciation in tools.. \$80.38		3,92

CLEANING SEWERS, NORTH  
DIVISION.

Labor..... \$8,003.39		
Water used..... 640.00		
Repairing wagon..... 34.00		
Candles ..... 11.49		
	8,688.88	
Amount carried forward .	\$24,644.35	16,10

	Cash Payments.	True Cost.
Amount brought forward.	\$24,644.35	16,104.86
ADD—		
For depreciation in tools..	<u>\$40.19</u>	<u>\$8,729.07</u>

CLEANING SEWERS, SOUTH  
DIVISION.

Labor .....	11,113.26		
Water used.....	560.00		
Repairing wagon.....	34.00		
Candles .....	7.10		
Rubber boots.....	<u>4.75</u>		
		11,719.11	
ADD—			
For depreciation in tools..	40.19		11,759.30

CLEANING SEWERS, WEST  
DIVISION.

Labor.....	14,019.63		
Water used.....	1,130.00		
Repairing wagon.....	34.00		
Candles .....	4.00		
Rubber boots.....	5.75		
Oil .....	<u>1.20</u>		
		15,194.58	
ADD—			
For depreciation in tools..	<u>\$80.38</u>		<u>15,274.96</u>

HOUSE DRAINS.

Labor,.....	\$5,303.76		
Two draughtsman.....	1,800.00		
Pipe used.....	<u>2,474.94</u>		
Amount carried forward..	<u>\$9,578.70</u>	<u>51,558.04</u>	<u>51,868.19</u>



# SECOND ANNUAL REPORT OF

		Cash Payments.
Amount brought forward	\$9,578.70	51,558.04
Stationery books.....	34.00	
Advertising.....	13.28	
Horse Keeping.....	73.80	
Hardware.....	9.00	
Cement.....	3.10	
		9,711.88
DEDUCT—		
Amount received for permits.....	\$9,760.25	
STOCK ACCOUNT.		
Hardware.....	\$194.64	
Pails.....	49.25	
Hose.....	42.50	
Rope.....	30.25	
Hose cart.....	75.00	
Sheeting.....	153.04	
Repairing tools.....	7.79	
		552.47
DEDUCT—		
Amount received for depreciation in tools....	402.03	
STREET INTERSECTIONS.		
Labor.....	3,262.99	
Brick used.....	573.37	
Cement used.....	652.60	
Sand used.....	131.58	
Lumber used.....	370.35	
Brick used.....	605.00	
Covers used.....	876.72	
Horse keeping.....	150.37	6,622.98
Amount carried forward		\$68,445.37 524

	Cash Payments.	True Cost
Amount brought forward	898,445.37	52,018.63
ADD—		
For depreciation in tools 80.51		
DEDUCT—		
Amount received from		
labor and material..... 519.25		
	<hr/>	
	438.74	6,184.24

## SEWERAGE SINKING FUND.

Paid Sewerage Sinking			
Fund in hands of City			
Treasurer its portion of			
Sewerage Tax for 1877 500.00			
Paid River Improvement			
Sinking Fund in hands			
of the City Treasurer			
its portion of Sewerage			
Tax for 1877..... 500.00			
	<hr/>		
		1,000.00	1,000.00

CERTIFICATES OF INDEBT-  
EDNESS.

Revenue warrants paid	408,581.00
DEDUCT—	
Amount received for rev-	
enue warrants..... 598,809.00	

## SEWERAGE LOAN INTEREST.

Remittance to Am. Ex-		
change National Bank		
to pay July 1877 interest 88,054.58		
	<hr/>	<hr/>
Amount carried forward \$88,054.58	478,026.37	59,202.87

	Cash Payments.	True Cost.
Amount brought forward	\$88,054.58	478,026.37
Remittance to Am. Exchange National Bank		59,202.87
to pay Jan. 1878 interest	87,773.89	
Interest paid in Chicago.	8,330.00	
Paid River Improvement Fund its portion of Sewerage Tax for interest .....	183,915.46	
Interest on Revenue Warrants .....	27,967.98	
	<u>396,041.91</u>	
DEDUCT—		
Amount received from indebtedness Fund .....	10,000.00	
		<u>386,041.91</u>
Total expenditures..	<u>874,068.28</u>	<u>445,244.78</u>

NOTE—Of the above cash payments \$408,581 was for time warrants paid.

## SEWERAGE TAX FUND.

STATEMENT of Receipts by the Department of Public Works and detailed statement of Expenditures, from January 1st, 1877, to December 31st, 1877, inclusive.

### RECEIPTS.

Appropriation by Common Council	\$301,087.50
Received from Revenue Warrants.	95,865.00
“ “ Indebtedness fund..	15,000.00
“ for Constructing sewers for private parties .....	878.40
Amount carried forward ....	<u>\$412,830.90</u>

Amount brought forward.....	\$412,830.90	
Received for brick used in other de- partments ....	1,309.28	
Received for pipe used in other de- partments.....	2,474.94	
Received for covers used in other departments .....	2,154.14	
Received for covers sold.....	17.10	
“ “ contract forfeit....	100.00	
Total receipts.....		\$418,886.36

## EXPENDITURES.

	Cash Payments.	True Cost.
SEWERS, NORTH DIVISION.		
Labor .....	\$1,145.47	
Engineers.....	1,095.80	
Bricks.....	100.92	
Sand.....	25.00	
	<u>2,367.19</u>	
ADD —		
For sewers constructed by private parties .....	533.00	
	<u>2,900.19</u>	
DEDUCT—		
Amount transferred to 15th ward .....	2,400.11	
Amount transferred to 16th ward .....	250.04	
Amount transferred to 17th ward.....	250.04	
	<u>2,900.19</u>	
Amount carried forward	\$2,367.19	

# SECOND ANNUAL REPORT OF

Amount brought forward.	Cash Payments.	Total
	\$2,367.19	

## SEWERS, SOUTH DIVISION.

Labor.....	755.24	
Engineers.....	1,329.00	
Brick.....	31.57	
Cement.....	11.47	
Sand.....	25.00	
	<hr/>	2,152.28

## DEDUCT—

Amount received for labor and material .....	179.10
Amount transferred to 4th ward.....	357.14
Amount transferred to 5th ward.....	1,616.04
	<hr/>
	2,152.28

## SEWERS, WEST DIVISION.

Labor.....	902.35	
Engineers .....	1,225.00	
Constructing sewer.....	391.00	
Brick.....	727.29	
Cement.....	88.62	
Sand.....	25.00	
	<hr/>	3,359.26

## ADD—

For money advanced by private parties to build sewer.....	659.30
	<hr/>

Amount carried forward .	<hr/>	\$7,878.73
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	Cash Payments.	True Cost.
Amount brought forward.	\$7,878.73	
DEDUCT—		
Amount transferred to 6th ward.....	980.40	
Amount transferred to 7th ward....	58.68	
Amount transferred to 8th ward .....	87.92	
Amount transferred to 11th ward.....	58.68	
Amount transferred to 12th ward.....	716.19	
Amount transferred to 13th ward....	686.85	
Amount transferred to 14th ward .....	670.54	
Amount received for contract forfeit .....	100.00	
	<u>3,359.26</u>	
COVERS ACCOUNT.		
Labor .....	2,790.51	
Nails.....	899.10	
Lumber.....	6,121.17	
	<u>9,810.78</u>	
DEDUCT—		
Amount received for covers charged sundry Ward accounts, and covers sold	6,238.24	3,572.54
	<u>6,238.24</u>	<u>3,572.54</u>
Amount carried forward..	\$17,689.51	3,572.54

	Cash Payments.	True Cost.
Amount brought forward.	\$17,689.51	3,572.54

## SEWERAGE PIPE.

Sewer pipe purchased.....	13,623.11	
Labor.....	591.11	
Advertising.....	28.15	
	<u>          </u>	14,242.37

## DEDUCT—

Amount received for pipe, charged sundry Ward accounts, and pipe used in house drain junctions.	16,524.23
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## SEWERAGE BRICK.

Labor.....	374.57	
Brick.....	379.53	
Advertising.....	48.51	
	<u>          </u>	802.61

## DEDUCT—

Amount charged to sundry Ward accounts, and brick sold.....	2,816.49
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## CEMENT ACCOUNT.

Cement on hand.....	128.75	128.75
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## WARD 6.

Constructing sundry sewers	6,681.71	
Labor.....	1,827.21	
Cement.....	1,646.36	
	<u>          </u>	
Amount carried forward.	\$10,155.28	32,863.24
		<u>          </u>
		3,701.29

	Cash Payments.	True cost.
Amount brought forward \$10,155.28	32,863.24	3,701.29
Brick..... 4,540.08		
Pipe..... 80.90		
Sand..... 39.95		
Plumbing..... 80.57		
Stone..... 106.68		
Lumber..... 55 21		
	<u>15,058.67</u>	
<b>Add—</b>		
Amount transferred from brick account..... 236.88		
Amount transferred from pipe account..... 2,245.37		
Amount transferred from covers account ... 474.00		
Amount transferred from sewers West Division .. 980.40		
	<u>\$3,936.65</u>	
		18,995.32

## WARD 5.

Constructing sundry sewers 7,648.25		
Labor..... 2,414 58		
Cement.... 2,135.23		
Brick..... 3,466.87		
Sand..... 39.09		
Plumbing ..... 197.22		
	<u>15,901.24</u>	
<b>Add—</b>		
Amount transferred from covers account.... 1,014.00		
Amount carried forward . \$1,014.00	<u>63,823.15</u>	<u>22,696.61</u>



		Cash Payments.	True Cost.
Amount brought forward	\$1,014.00	63,823.15	22,696.61
Amount transferred from			
pipe account.....	3,295.89		
Amount transferred from			
brick account.....	389.50		
Amount transferred from			
sewers South Division..	1,616.04		
	<hr/>		
	\$6,315.43		22,216.67

## WARD 14.

Constructing sundry sewers	4,841.47		
Labor.....	1,721.08		
Cement.....	747.43		
Brick.....	1,411.74		
Sand.....	10.00		
Plumbing.....	55.60		
	<hr/>	8,787.32	
ADD—			
Amount transferred from			
covers account.....	670.00		
Amount transferred from			
pipe account.....	3,540.86		
Amount transferred from			
brick account .....	95.00		
Amount transferred from			
Sewers West Division..	670.54		
	<hr/>		
	4,976.40		13,763.72

## WARD 8.

Constructing sewer.....	345.00		
Labor.....	280.72		
	<hr/>		
Amount carried forward	\$625.72	72,610.47	58,677.00

		Cash Payments.	True Cost.
Amount brought forward	\$625.72	72,610 47	58,677.06
Cement.....	181.66		
Brick.....	152.83		
Sand.....	7.50		
Plumbing.....	47.00		
	<hr/>	1,014.71	

## ADD—

Amount transferred from covers account.....	90.00
Amount transferred from pipe account.....	256.64
Amount transferred from brick account.....	61.95
Amount transferred from sewers West Division..	87.92
	<hr/>
	496.51

1,511.22

## WARD 12.

Constructing sundry sewers	8,931 88
Labor.....	880.98
Cement.....	520.72
Brick.....	1,473.51
Sand.....	2.02
Plumbing.....	72.50
	<hr/>

11,881.61

## ADD—

Amount transferred from covers account.....	270.00
Amount transferred from pipe account.....	645.32
Amount transferred from brick account.....	21.00
	<hr/>

Amount carried forward .	936.32	85,506.79	60,188.22
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		Cash Payment	True Cost.
Amount brought forward,	\$936.32	\$85,506.79	\$60,188.22
Amount transferred from sewers West Division,	716.19		
	<u>1,652.51</u>		

## DEDUCT—

Amount received for con- structing sewer.....	659.30		
	<u>993.21</u>		12,874.82

## WARD 13.

Constructing sundry sew- ers .....	6,134.52		
Labor .....	1,138.48		
Brick .....	2,050.34		
Cement .....	899.80		
Sand.....	4.89		
Plumbing.....	100.00		
	<u>10,328.03</u>		

## ADD—

Amount transferred from Covers account.....	295.00		
Amount transferred from pipe account.....	1,183.57		
Amount transferred from brick account.....	92.80		
Amount transferred from sewers, W. Div.....	686.85		
	<u>2,258.22</u>		12,586.25
Amount carried forward.		<u>\$95,834.82</u>	<u>\$5,649.29</u>

	Cash Payments.	True Cost.
Amount brought forward.	\$95,834.82	\$5,649.29

## WARD 15.

## Constructing sundry sew-

ers .....	12,471.37
Labor .....	3,942.56
Brick .....	5,195.24
Cement .....	2,540.02
Plumbing .....	29.68
Sand .....	39.43

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24,218.30

## ADD—

Amount transferred from covers account .....	794.00
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Amount transferred from pipe account .....	1,206.15
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Amount transferred from brick account .....	323.50
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Amount transferred from sewers, N. Div. ....	2,400.11
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4,723.76

## DEDUCT—

Amount received for labor	40.00
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4,683.76

28,802.06

## WARD 7.

Constructing sewer .....	\$1,000.00
Labor .....	287.73
Cement .....	101.27
Brick .....	100.60
Sand .....	6.30

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1,495.90

Amount carried forward

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\$121,549.02

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114,451.35

# SECOND ANNUAL REPORT OF

Amount brought forward.

Cash Payments.  
\$121,549.02 1

ADD—

Amount transferred from  
covers account..... \$115.00

Amount transferred from  
pipe account..... 558.66

Amount transferred from  
brick account..... 58.00

Amount transferred from  
sewers, W. Div..... 58.68

790.34

## WARD II.

Constructing sewer..... 584.00

Labor ..... 144.90

Cement ..... 82.52

Brick..... 144.45

955.87

ADD—

Amount transferred from  
covers account..... 45.00

Amount transferred from  
pipe account..... 105 54

Amount transferred from  
brick account..... 30.94

Amount transferred from  
sewers, W. Div..... 58.68

240.16

Amount carried forward

\$122,504.89

1, 1171

	Cash Payments.	True Cost.
Amount brought forward	\$122,504.89	117,933.62

## WARD 4.

Constructing sewer.. . . .	475.19
Brick . . . . .	2,013.09
Labor . . . . .	264.80
Cement . . . . .	208.45

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 2,961.53

## ADD—

Amount transferred from covers account . . . . .	55.00
Amount transferred from pipe account . . . . .	14.65
Amount transferred from brick account . . . . .	4.08
Amount transferred from sewers, S. Div. . . . .	357.14
	<hr/>
	430.87

3,392.40

## WARD 16.

Constructing sewers . . . . .	1,254.67
Labor . . . . .	339.00
Cement . . . . .	150.75
Brick . . . . .	216.94
Sand . . . . .	2.13

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 1,963.49

## ADD—

Amount transferred from covers account . . . . .	90.00
Amount transferred from pipe account . . . . .	588 02

Amount carried forward	\$678.02	127,429.91	121,326.02
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		Cash Payments.	True Cost.
Amount brought forward	\$ 678.02	127 429 91	121,326.02
Amount transferred from brick account.....	18.56		
Amount transferred from sewers, N. Div.....	250.04		
	<hr/> 946.62		2,910.11

## WARD 17.

Constructing sewers.....	609.83		
Labor.....	775.01		
Cement.....	199.10		
Brick.....	295.02		
Sand .....	20.51		
	<hr/> 1,899.47		
Add—			
Amount transferred from covers account.....	155.00		
Amount transferred from pipe account.....	408.62		
Amount transferred from brick account.....	175.00		
Amount transferred from sewers, N. Div.....	250.04		
	<hr/> 988.66		2,888.13

## SUNDRY SEWERS.

Paid H. Potwin for con- structing sewer.....	354.73		
Paid Jas. Eastman for con- structing sewer.....	811.36		
	<hr/>		
Amount carried forward.	\$1,166.09	129,329.38	127,124.26

		Cash Payments.	True Cost.
Amount brought forward	\$1,166.09	129,329.38	127,124 26
Paid J. H. Kellan for constructing sewer.....	32.37		
Paid J. C. Clement for constructing sewer.....	66.91		
Paid C. V. Spear for constructing sewer.....	69.07		
Paid Potwin & Corby for constructing sewer....	211.50		
Paid Henry Potwin for constructing sewer....	182.45		
Paid Aug. Maseman for constructing sewer....	228.75		
	<hr/>	1,957.14	1,957.14

CERTIFICATE OF INDEBT-  
EDNESS.

Revenue Warrants paid..	100,307.45
DEDUCT—	
Amount received from revenue warrants.....	100,307.45

INTEREST ON REVENUE  
WARRANTS.

Interest paid on revenue warrants .....	8,186.37
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DEDUCT—

Amount received from indebtedness fund.....	15,000.00
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Total expenditures. ....	<hr/> \$239,780.34	<hr/> \$129,081.40
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## DEPARTMENT OF PUBLIC WORKS APPROPRIATION FUND.

STATEMENT of Receipts by the Department of Works from January 1, 1877, to December 31, 1877, in and detailed statement of Expenditures during the same

### RECEIPTS.

Amount of Appropriation by Common Council.....	\$708,119.87
Amount received from revenue warrants.....	475,534.00
Amount received from Indebted- ness Fund.....	70,000.00
Amount received from railroad companies, account Milwaukee Avenue viaduct.....	60,426.91
Amount received from special assessments, account Blue Island Avenue viaduct.....	4,909.06
Amount received for special assessment expenses.....	17,443.61
Amount received from Street Lamp Fund.....	7,706.89
Amount received from vouchers cancelled.....	896.83
Amount received from Cook County rent City Hall.....	3,300.00
Amount received from Cook County, heating City Hall.....	1,597.20
Amount received for repaving...	1,250.88
Amount carried forward.....	<hr/> \$1,351,185.25

Amount brought forward.....	\$1,351,185.75	
Amount received from Permits issued.....	230.00	
Amount received from labor.....	103.75	
Amount received from contract forfeit.....	200.00	
Amount received from stone sold at Lake Park.....	45.00	
Amount received from sod sold at Lake Park.....	16.75	
Amount received from damage to bridges.....	20.00	
Amount received from broken lamp posts.....	38.00	
Amount received from broken lamps.....	3.50	
Amount received from Tips.....	2 00	
Total receipts.....		\$1,351,844.25

## EXPENDITURES.

## NORTH DIVISION.

	Cash Payments.	True Cost.
Cleaning improved streets \$	8,317.49	
Labor on streets.....	18,535.28	
Lumber.....	1,272.97	
Blocks.....	427.87	
Cinders.....	575.00	
Gravel.....	390.80	
Nails.....	148.45	
Hardware.....	161.12	
Horse keeping.....	40.00	
	<u>29,868.98</u>	
Amount carried forward		\$8629,8.98

		Cash Payments.	True cost.
Amount brought forward		\$29,868.98	
DEDUCT—			
Amount received for re-			
paving . . . . .	\$ 301.50		
Amount received from			
sidewalks, N. Div. . . . .	1,052.49		
	<hr/>		
	1,353.99		\$28,514.99

## SOUTH DIVISION.

Cleaning improved streets	\$13,025.71		
Labor on streets . . . . .	30,395.38		
Gravel . . . . .	11,473.75		
Lumber . . . . .	3,640.26		
Blocks . . . . .	2,172.36		
Stone . . . . .	159.85		
Hardware . . . . .	106.45		
Cinders . . . . .	382.00		
Repairing tools . . . . .	318.55		
Nails . . . . .	206.46		
Sprinkling . . . . .	43.00		
Horse keeping . . . . .	55.50		
Rent lot . . . . .	40.00		
	<hr/>	62,019.27	
ADD—			
For dirt furnished Healey			
Slough . . . . .	85.00		
	<hr/>		
DEDUCT—			
Amount received for re-			
paving . . . . .	387.25		
	<hr/>		
Amount carried forward	\$387.25	91,888.25	28,514.99

		Cash Payments.	True Cost.
Amount brought forward.	\$387.25	\$91,888.25	\$28,514 99
Amount received from sidewalks, S. Div.....	1,878.29		
	<hr/> 2,265.54		59,753.73

## WEST DIVISION.

Cleaning improved streets	\$16,644.99		
Labor on streets.....	54.55	1.10	
Lumber .....	8,043.42		
Blocks .....	2,401.72		
Nails.....	791.85		
Stone .....	754.00		
Rent of lot .....	162.50		
Horse keeping.....	130.00		
Cinders .....	262.50		
Gravel.....	326.50		
Repairing tools.....	213.41		
Hardware.....	86.67		
Brooms.....	18.75		
Repairing wagon.....	3.70		
Advertising.....	40.46		
Docking lumber.....	19.03		
	<hr/>	84,450.60	

## ADD—

For blocks transferred from LaSalle Street Tunnel.....	\$119.70
	<hr/>

## DEDUCT—

Amount transferred from sidewalks.....	\$3,217.43
	<hr/>

Amount carried forward	\$3,217.43	\$176,338.85	\$38,268.72
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		Cash Payments.	True Cost.
Amount brought forward.	\$3,217.43	\$176,338.80	\$88,268 72
Amount received for re-			
paving.....	728.38		
	<hr/>		
	\$3,945.81		
Less.....	119.70		
	<hr/>		
	3,826.11		80,624.49

## SIDEWALKS, NORTH

## DIVISION.

Salary of Inspector.....	\$891.64		
Lumber.....	55.87		
	<hr/>	947.51	
ADD—			
Amount transferred to			
North Division.....	\$1,052.49		2,000.00

## SIDEWALKS, SOUTH

## DIVISION.

Salary of Inspector.....	\$991.66		
Building walk.....	110.25		
Lumber.....	10.50		
Nails... ..	9.30		
	<hr/>	1,121.71	
ADD—			
Amount transferred to			
South Division.....	\$1,878.29		3,000.00
	<hr/>		<hr/>
Amount carried forward		\$178,408.07	\$173,893.21

		Cash Payments.	True Cost.
Amount brought forward		\$178,408.07	\$173,893.21
SIDEWALKS, WEST			
DIVISION.			
Salary of Inspectors.....	\$ 1,500.00		
Building walk.....	217.35		
Lumber.....	48.35		
Advertising.....	16.87		
	<hr/>	1,782.57	
ADD—			
Amount transferred to			
West Division.....	3,217.43		
			5,000.00
SPECIAL ASSESSMENTS.			
Salaries of Clerks and			
Engineers .....	\$7,799.92		
Court fees and Treasur-			
er's fees.....	3,967.65		
Salary of Special Com-			
missioners.....	2,141.03		
Advertising .....	2,222.80		
Salary of Rodman.....	900.00		
Notary fees.....	179.50		
Salary of Inspector.....	75.00		
Printing.....	9.50		
Stationery.....	58.50		
Stamps ... ..	50.00		
	<hr/>	17,403.90	
DEDUCT—			
Amount received from			
Special Assessments..	\$17,443.61		
Amount carried forward	<hr/>	\$197,594.44	\$178,893.21

	Cash Payments.	True Cost.
Amount brought forward.	\$197,594.54	\$178,893.21

OFFICE EXPENSE.

1/3 Sa'ary of City Engineer	\$1,166.66	
1/3 Salary of Secretary....	666.66	
1/3 Salary of Superintend- ent .....	800.00	
1/3 Salary of Bookkeeper.	733.33	
1/3 Salary of Asst. Book- keeper .....	466.66	
1/3 Salary of City Engin- eer's Clerk.....	400.00	
Labor.....	716.42	
Printing and Stationery.	1,128.39	
Salary of Engineer.....	1,400.00	
Salary of 2 draughtsmen	1,870.00	
Engraving .....	161.68	
Advertising.....	59.75	
On account printing An- nual Report.....	66.67	
Two maps.....	27.00	
	<hr/>	9,663.22

DEDUCT—

Amount received for voucher cancelled....	62.62	
		9,600.60

CITY HALL.

Salary of Engineer, Fire- man, Janitors and Watchman.....	\$3,420.00		
Repairing building.....	2,477.98		
Gas used.....	1,606.25		
	<hr/>	<hr/>	<hr/>
Amount carried forward .	\$7,504.23	\$207,257.76	\$188,493.81

		Cash Payments.	True Cost.
Amount brought forward.	\$7,504.23	\$207,257.76	\$188,493.81
Coal used.....	2,000.13		
Lumber.....	1,013.35		
Painting and Calcimining	1,266.63		
Smoke burners.....	600.00		
Carpeting.....	410.71		
Sprinkling Adams and LaSalle Streets.....	266.43		
Plumbing.....	226.33		
Hardware.....	213.39		
Ventilators.....	40.00		
Brooms.....	21.26		
Soap.....	52.65		
Matches.....	17.65		
Dusters.....	24.50		
Repairing boiler.....	67.55		
Compound.....	8.75		
Advertising.....	21.04		
One desk.....	85.00		
Shades.....	25.95		
Sewer pipe.....	17.44		
Iron work.....	54.87		
Toweling.....	17.25		
Ice.....	36.10		
	<hr/>	13,991.21	
DEDUCT—			
Amount received from Cook County rent....	\$3,300.00		
Amount received from Cook County heating.	1,597.20		
	<hr/>		
	\$4,897.20		9,094.01
	<hr/>		<hr/>
Amount carried forward.		\$221,248.97	\$197,587.82



# SECOND ANNUAL REPORT OF

	Cash Payments	
Amount brought forward.	\$221,248.97	\$197,115.07

## WASHINGTON PARK.

Trees planted in 1875...	\$1,760.00	
Labor .....	754.85	
Hardware.....	.50	
Seed.....	2.40	
Hose .....	13.20	
Plumbing... ..	10.15	
	<hr/>	2,541.10

25

## ELLIS PARK.

Labor .....	\$1,112.50	
Glass.....	2.57	
	<hr/>	1,115.07

1,11

## LAKE PARK.

Labor .....	\$2,799.21	
Trees planted in 1875...	1,309.00	
Filling.....	525.75	
Castings .....	112.40	
Sprinkling.....	156.00	
Plumbing.....	197.46	
Lumber.....	17.25	
Hardware .....	40.77	
Repairing mowers.....	31.89	
Seed .....	44.97	
One hose-reel.....	15.00	
Iron pipe.....	36.83	
	<hr/>	5,286.53

Amount carried forward.	\$230,191.67	\$201,243.14
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Cash Payments.

True Cost.

Amount brought forward

\$230,191.67 \$201,243.99

## DEDUCT—

Amount received for

labor ..... \$ 39.75

Amount received for

stone sold ..... 45.00

---

84.75

5,201 78

## UNION PARK.

Labor ..... \$1,928.76

Feed for animals ..... 396.54

Plumbing ..... 72.87

Repairing lawn mowers. 35.29

One lawn mower ..... 18.50

Coal ..... 4.60

Cement ..... 3.41

---

2,459.97

2,459.97

## JEFFERSON PARK.

Labor ..... \$956.37

Feed for fowls ..... 49.17

Hardware ..... 19.00

Repairing mower ..... 10.91

Plumbing ..... 4.05

Plants ..... 15.00

Hose ..... 10.63

Cement ..... 17.40

Stone ..... 11.83

Sand ..... 3 75

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1,098.11

---

1,098.11

Amount carried forward

---

\$233,749.75 \$210,003.85

	Cash Payments.	True Cost.
Amount brought forward.	\$233,749.75	\$210,003.85

## VERNON PARK.

Labor .....	\$1,041.19		
Lumber .....	160.43		
Building sewer.....	262.40		
Nails .....	6.25		
Repairing mower.....	6.12		
	<hr/>	1,476.39	1,476.39

## WICKER PARK.

Labor .....	\$ 933.56		
Lumber .....	53.42		
Hardware .....	13.75		
Seats .....	84.00		
Paint .....	9.15		
	<hr/>	1,093.88	1,093.88

WASHINGTON STREET  
TUNNEL.

Salary of Engineer.....	\$ 900.00		
Labor, repairing tunnel.	2,471.78		
Stone .....	1,116.35		
Brick .....	369.75		
Cement .....	653.30		
Lead .....	305.33		
Gas-fitting .....	306.64		
Cleaning tunnel.....	311.84		
Castings.....	18.49		
Hardware .....	52.10		
Alcohol .....	24.85		
Coal .....	74.21		
	<hr/>	<hr/>	<hr/>
Amount carried forward..	\$6,604.67	\$236,320.02	\$212,574.12

		Cash Payments.	True Cost.
Amount brought forward.	\$6,604.67	\$236,320.02	\$212,574.12
Globes.....	28.26		
Brooms.....	14.00		
Sand .....	38.12		
Sewer pipe.....	17.34		
Lumber.....	15.73		
	<hr/>	6,718.12	6,718.12

LA SALLE STREET  
TUNNEL.

Salary of Engineer.....	\$ 900.00		
Labor.....	134.38		
Cleaning tunnel.....	396.84		
Cement.....	115.50		
Paving blocks.....	119.70		
Iron work.....	167.90		
Repairing boiler.....	170 47		
Alcohol .....	25.35		
Stone.....	31.20		
Coal .....	46.30		
Lumber .....	29.40		
Globes .....	14.17		
Gas-fitting.....	54.05		
Castings.....	16.25		
Plumbing.....	7.34		
Hardware .....	4.93		
Advertising.....	7.90		
Salt.....	1.35		
	<hr/>	2,243.03	
DEDUCT—			
For paving blocks charged W. Div.....	\$119.70		2,123.33
Amount carried forward..	<hr/>	\$245,281.17	\$221,415.57

		Cash Payments.	True Cost.
Amount brought forward.		\$245,281.17	\$221,415.57
STREET SIGNS.			
New signs.....	\$8.15		
Painting signs.....	1.75		
		9.90	9.90
PUBLIC HYDRANTS.			
Plumbing.....		306.44	306.44
PUBLIC BENEFITS.			
Improving intersections of streets.....	\$87,874.38		
Salary of Inspectors....	1,312.00		
Building wall.....	381.22		
Advertising.....	14.94		
		89,582.54	
DEDUCT—			
Amount received for voucher cancelled....	\$811.06		
			88,771.48
STREET LAMPS.			
Glass.....	\$2,061.27		
Labor, repairing lamps.	1,917.33		
Lamps .....	1,080.30		
Repairing lamps.....	580.23		
Lamp posts.....	656.70		
Tips .....	158.66		
Shoeing horse.....	17.00		
Repairing wagon.....	15.85		
Amount carried forward .	\$6,487.34	\$335,180.05	\$310,503.39

		Cash Payments.	True Cost
Amount brought forward	\$6,487.34	\$335,180.05	\$310,503.39

Horse feed.....	50.69		
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Lead.....	17.90		
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Advertising.....	34.88		
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	<u>        </u>	6,590.81	
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## DEDUCT—

Amount received for broken posts.....	\$26.00		
--	---------	--	--

Amount received for broken lamps... ..	3.50		
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Amount received for tips	2.00		
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	<u>        </u>		
	\$31.50		

			6,559.31
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## CHICAGO HARBOR.

Salary of harbor masters	\$1,800.00		
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Labor on Ogden Ditch			
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dam.....	928.77		
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Building dock.....	305.00		
--------------------	--------	--	--

Board of men.....	120.86		
-------------------	--------	--	--

Advertising.....	24.60		
------------------	-------	--	--

Driving piles.....	13.00		
--------------------	-------	--	--

Dredging.....	65.15		
---------------	-------	--	--

Use of Tug.....	52.00		
-----------------	-------	--	--

Hardware.....	38.25		
---------------	-------	--	--

Lumber.....	16.80		
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	<u>        </u>	3,364.43	
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			3,364.43
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## LAND DAMAGES AT HAR-

## RISON ST. BRIDGE.

Land condemned... ..	\$12,094.66		
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Dredging and docking..	2,878.85		
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Amount carried forward	\$14,973.51		
------------------------	-------------	--	--

	<u>        </u>	\$345,135.29	
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			\$320,427.13
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# SECOND ANNUAL REPORT OF

		Cash Payments.	Trail
brought forward	\$4,973.51	\$345,135.29	\$320,421.11
es.....	95.00		
iving piles.....	87.06		
		15,155.57	15,155.57
<b>LAND DAMAGES AT CHICAGO &amp; ALTON R.R. CO.'S BRIDGE.</b>			
Paid B. McKenna for land.....		5,000.00	5,000.00
<b>BRIDGE TENDERS SALARIES.</b>			
Amount paid for tending bridges .....		37,171.25	37,171.25
<b>BRIDGE DEPARTMENT.</b>			
Salary of Asst. Superintendent.....	\$1,500.00		
Labor of carpenters....	9,264.99		
Lumber .....	4,245.05		
Driving piles.....	1,003.66		
Iron work.....	1,091.85		
Lamps and repairs.....	206.73		
Coal.....	299.70		
Rope and chain.....	186.81		
Painting bridges.....	495.67		
Rent of lot for Erie St. bridge.....	375.00		
Oil.....	365.86		
Amount carried forward	\$19,035.32	\$402,462.11	\$377,711.11

		Cash Payments.	True Cost.
Amount brought forward	\$19,035.32	\$402,462 11	\$377,753.95
Hardware.....	123.82		
Repairing State Street bridge.....	375.00		
Nails.....	380.15		
Brooms and matches...	54.00		
Damage to vessel .....	86.50		
Advertising.....	94.58		
Castings .....	71.64		
Stone work.....	18.00		
Clocks and reps.....	24.25		
Building dock.....	24.00		
Two bills.....	6.50		
Plastering .....	28.38		
	<hr/>	20,322.14	
DEDUCT—			
Amount received for voucher cancelled....	\$ 23.15		
Amount received for damages.....	20.00		
Amount received for for- feit of contract.....	200.00		
Amount received for broken post.....	12.00		
	<hr/>	255.15	
			20,066.99
HARRISON ST. BRIDGE.			
Paid American Bridge Co., contractors.....		7,556.25	
			7,556.25
Amount carried forward		\$430,340 50	\$405,377.19



	Cash Payments.	True Cost
Amount brought forward.	\$430,340.50	\$405,377.19
NORTH AV. BRIDGE.		
Paid Conro, Carlin & Co., Contractors....	4,250.00	4,250.00
FULLER ST. BRIDGE.		
Paid G. W. James, con- tractor.....	4,210.00	4,210.00
NORTH HALSTED ST. BRIDGE.		
Paid W. B. Howard, contractor.....	4,190.00	4,190.00
BLUE ISLAND AV. VIADUCT.		
Raising buildings.....	\$11,508.50	
Brick.....	277.75	
Laying gas pipe .....	836.41	
Lithographing.....	95.00	
Engraving .....	25.50	
	<hr/>	
	12,743.16	
DEDUCT—		
Amount received from special assessments..	\$4,909.06	
		7,834.10
PERMITS.		
Salary of special consta- ble .....	\$1,058.32	
Printing.. .....	10.00	
	<hr/>	
	1,068.32	
Amount carried forward .	\$456,801.98	\$425,861.29

	Cash Payment.	True Cost.
Amount brought forward.	\$456,801.98	\$425,861.29

## DEDUCT—

Amount received for permits .....	\$230.00	
-----------------------------------	----------	--

838.32

## MILWAUKEE AV.

## VIADUCT.

Raising buildings.....	\$71,879 52	
------------------------	-------------	--

Paid Thos. Leighton, contractor.....	34,690.00	
--------------------------------------	-----------	--

Paid American Bridge Co. contractor.....	14,629.64	
--	-----------	--

Paid J. Kincade, contractor .....	14,348.88	
-----------------------------------	-----------	--

Laying gas pipe .....	2,031.41	
-----------------------	----------	--

Brick.....	330.00	
------------	--------	--

Salary of Inspector....	362.50	
-------------------------	--------	--

Lumber .....	475.98	
--------------	--------	--

Building wall.....	190.51	
--------------------	--------	--

Advertising.....	19.13	
------------------	-------	--

Plumbing .....	26.79	
----------------	-------	--

Nails .....	52.50	
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Iron work.....	11.55	
----------------	-------	--

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139,048.41

## DEDUCT—

Amount received from R.R. Companies...	60,426.91	
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78,621.50

Amount carried forward.	\$595,850.39	\$505,321.11
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	Cash Payments	Tru
Amount brought forward.	\$595,850.39	\$505.11

## CLEANING NORTH

## BRANCH.

Paid Fitz Simmons & Connell, contractors..	\$54,632.06		
Salary of Inspectors...	7,265.08		
Lead .....	13 56		
Hardware.....	34.86		
Oil .....	15.45		
Advertising .....	91.67		
Coal .....	9.20		
Iron Work.....	36.94		
	<hr/>	62,098.82	62,098.

CERTIFICATE OF IN-  
DEBTEDNESS.

Revenue warrants paid.	599,999.43
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## DEDUCT—

Amount received for revenue warrants.....	\$599,999.43
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## INTEREST.

Interest paid on revenue warrants.....	48,733.01	48,733.
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## OGDEN DITCH DAM.

Paid Conro, Carkin & Co., contractors.....	1,300.00	
Total expenditures.....	\$1,307,981.65	\$617,451

## CITY HALL FUND.

		Cash Payments.	True Cost
Paid J. J. Egan, plans...	\$4,000.00		
Salary of draughtsman.	792.00		
Advertising.....	60.57		
Laying drains.....	30.46		
Hardware.....	57.20		
	<hr/>	\$4,940.23	
			\$4,940.23

## CONTRACTORS.

Paid John Sackley, excavating.....		1,483.62	1,482.62
Paid Mortimer & Tapper, foundations.....		14,096.96	14,096.96
		<hr/>	<hr/>
		\$20,520.81	\$20,520.81

## CITY BRIDEWELL FUND.

EXPENDITURES.		Cash Payments.	True Cost.
Sand.....	\$181 68		
Hardware .....	131.92		
Stone .....	44.60		
Nails.....	28.25		
Lumber . . . . .	291.06		
Lead and oil.....	45.70		
Lime .....	174.19		
Steam fitting.....	239.48		
Doors and sash.....	130.47		
Dredging.....	303.75		
Roofing .....	115.92		
Barrows.....	10.00		
Iron work.....	58.57		
	<hr/>	\$1,755.59	
Total expenditure.....			\$1,755.59

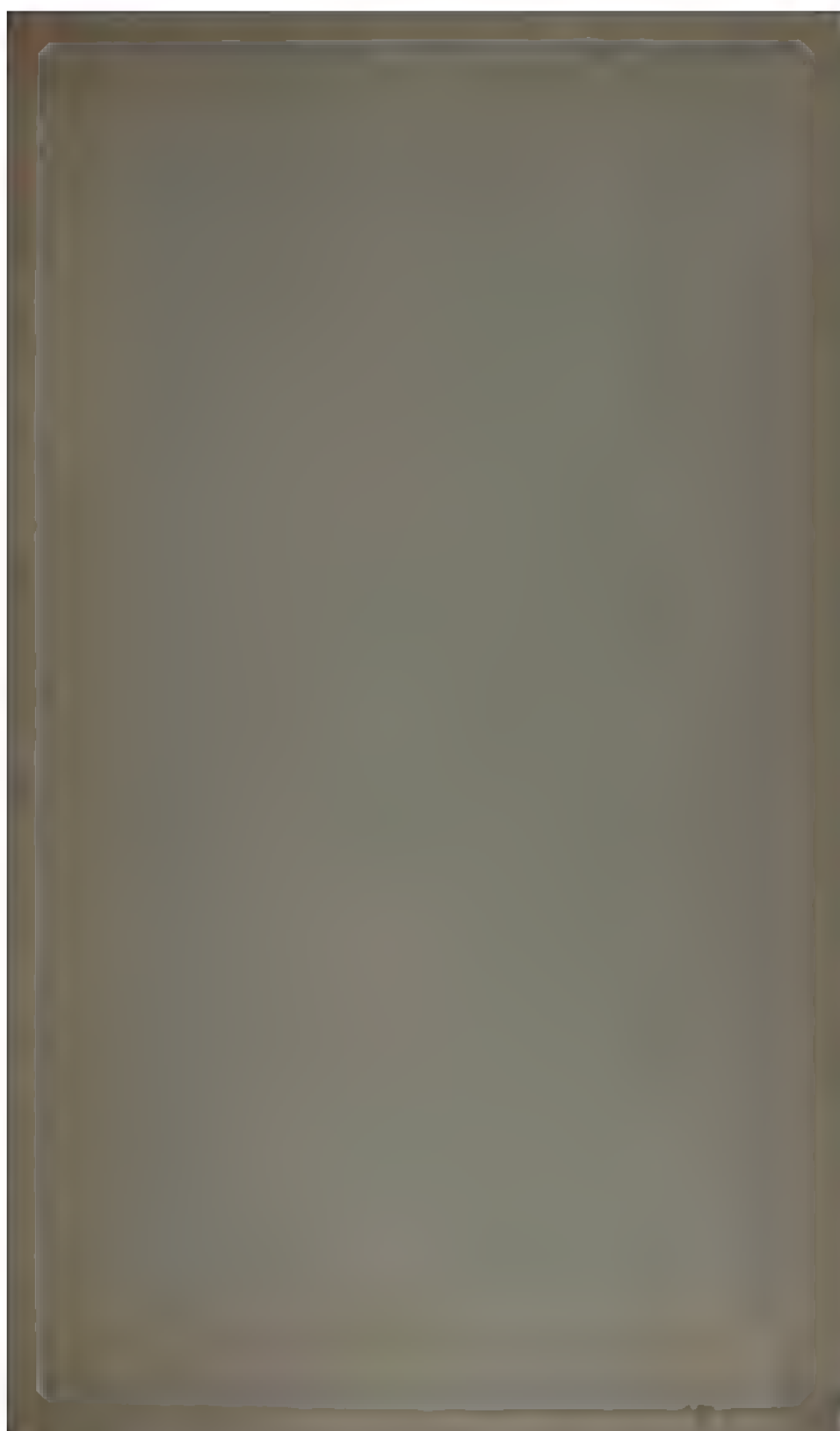
## RECAPITULATION.

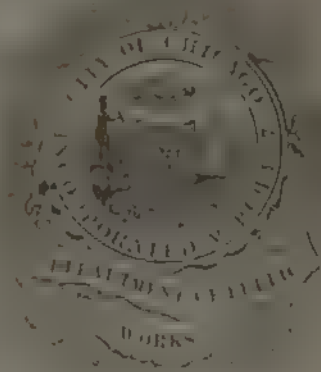
	Cash Payments.	True Cost.
Water fund brought forward . . . . .	\$1,812,422.42	\$952,792.27
Sewerage fund brought forward . . .	874,068.28	445,244.78
Sewerage tax fund brought forward	239,780.34	129,081.40
Appropriat'n fund brought forward	1,307,981.65	617,452.94
City Hall fund brought forward . . .	20,520.81	20,520.81
City Bridewell fund brought forward	1,755.59	1,755.59
Total expenditures . . . . .	\$4,256,529.09	\$2,166,847.79

Respectfully submitted,

E. M. JOHNSON,

*Accountant Department Public Works.*





1117  
20  
THIRD ANNUAL REPORT

OF THE

DEPARTMENT

OF

PUBLIC WORKS,

TO THE

City Council of the City of Chicago.

FOR THE FISCAL YEAR ENDING

DECEMBER 31, 1878

— — — — —

CHICAGO

CLARK & EDWARDS, PRINTERS, 17 & 19 LAKE STREET  
1879.

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1. The first part of the document is a list of names and titles, including "The Hon. Mr. Justice" and "The Hon. Mr. Justice".





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1879  
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OF THE

DEPARTMENT

OF

PUBLIC WORKS

TO THE

City Council of the City of Chicago,

FOR THE FISCAL YEAR ENDING

DECEMBER 31, 1878.

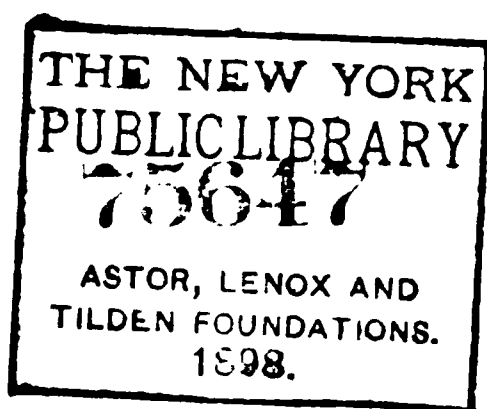
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1879.

1879  
1878



# DEPARTMENT OF PUBLIC WORKS.

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OFFICERS DURING THE YEAR 1878:

MONROE HEATH, MAYOR.

D. S. MEAD, Sec'y. E. S. CHESBROUGH, City Engineer.

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## DEPARTMENTAL:

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GEO. W. WILSON, *Sup't. Streets and Bridges.*

WM. H. CLARKE, *Asst. City Engineer*, (deceased) to Aug. 5.

BENZETTE WILLIAMS, *Asst. City Engineer*, the remainder of the year.

E. M. JOHNSON, *Accountant and Paymaster.*

H. J. JONES, *In Charge Special Assessments.*

D. C. CREGIER, *Chief Engineer North Div. Pumping Works.*

HENRY MASON, *Engineer West Div. Pumping Works.*

W. R. LARRABEE, *In Charge of Water Office.*

O. F. WOODFORD, *Water Tax Assessor.*

CHAS. BROWN, *Sup't. Water Meters.*

F. J. REED, *Cashier.*

F. C. MEYER, *In Charge of Map Department.*







## MAYOR'S REPORT.

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OFFICE OF THE DEPARTMENT OF PUBLIC WORKS, {  
CHICAGO, December 30th, 1878. }

*To the City Council of the City of Chicago:*

GENTLEMEN—I have the pleasure of submitting to your Honorable Body this, the Third Annual Report of the Department of Public Works.

In it is embraced statements in detail of the various improvements done under the supervision of the Department, the most important being the building of the new City Hall, the erection of a viaduct over the railroad tracks at Eighteenth street, and a swing bridge across the North Branch of the Chicago River at Fullerton avenue. The construction of main sewers and laying of main water pipes, together with street paving and general street repairs have been prosecuted vigorously, and will not vary materially from the amount of work done or improvements made during the previous year.

The pumping engines in the North and West Divisions have passed through the year performing their duty without any unusual interruption, or without requiring more than the ordinary amount of repairs, the North Division Pumping Works furnishing about 11,145,370,232 gallons, and the West Division pumping engines 8,418,918,000 gallons, making a total of 19,564,288,232 gallons of water furnished to the city during the year, being an average of 53,600,790 gallons per day. The greatest quantity of water pumped in twenty-four hours during the past year is 68,597,882 gallons.

The regularity and certainty with which our citizens receive their daily and yearly supply of water is due to the experience, faithfulness and skill of those in charge of these works.

The construction and maintenance of our system of water supply, together with the revenue derived therefrom, still continues to be a question of much importance. The rapid increase in the consumption, and the relative proportionate waste of water approaching so nearly the full capacity of our pumping machinery, suggests that additional power will be required at no distant day.

In view of the fact that it would require nearly two years to construct and place in position, ready for use, new pumping engines, and that before the end of this time (judging by the average increase of the past seven years) the whole pumping capacity of the pumps would be required to furnish the daily supply of water, leaving no margin for accidents which are liable to occur. It would, therefore, seem criminal to neglect or delay preparations for securing to the city such power and such machinery as will not only meet the daily growing demand, but sufficient at all times for the most extreme emergency.

The following table exhibits the quantity and cost of pipes laid since 1861, including the cost of five river tunnels for carrying water mains to connect the three divisions of the city :

YEAR.	NO. OF FEET.	COST.
1861.....	13,761	\$12,008.00
1862.....	50,881	39,197.00
1863.....	68,691	51,205.00
1864.....	62,657	104,828.00
1865.....	73,494	146,332.23
1866.....	60,550	121,589.23
1867.....	128,519	246,420.53
1868.....	161,083	266,961.35
1869.....	167,504	514,652.54
1870.....	180,727	508,855.52
1871.....	91,129	316,165.19
1872.....	122,007	317,385.06

## THE DEPARTMENT OF PUBLIC WORKS.

7

YEAR.	NO OF FEET.	COST.
1873.....	214,657	579,287.30
1874.....	184,723	512,781.04
1875.....	124,493	468,002.28
1876.....	31,100	86,997.76
1877.....	45,870	90,511.43
1878.....	28,380	77,617.77
	<hr/>	<hr/>
	1,810,226	342 miles and 4,466 feet.
Laid prior to 1861.....	87	" " 585 "
	<hr/>	<hr/>
Total to Dec. 31, 1878..	429	5,051

## INCOME.

The following table shows the total income of the Water Works from the time when the distribution of water commenced :

February 15, 1854, to January 1, 1862.....	\$744,244.19
Income for fifteen months ending April 1, 1863...	189,294.80
Income for the year ending April 1, 1864.....	192,246.39
Income for the year ending April 1, 1865.....	224,902.57
Income for the year ending April 1, 1866.....	253,114.49
Income for the year ending April 1, 1867.....	302,017.59
Income for the year ending April 1, 1868.....	338,929.28
Income for the year ending April 1, 1869.....	420,686.94
Income for the year ending April 1, 1870.....	476,968.24
Income for the year ending April 1, 1871.....	539,180.19
Income for the year ending April 1, 1872....	445,834.64
Income for the year ending April 1, 1873.....	544,465.90
Income for the year ending April 1, 1874.....	708,804.32
Income for the year ending April 1, 1875.....	705,926.64
Income for 9 months ending Dec. 31, 1875.....	637,996.54
Income for the year ending Dec. 31, 1876.....	833,963.78
Income for the year ending Dec. 31, 1877.....	908,500.64
Income for the year ending Dec. 31, 1878.....	944,190.97
	<hr/>
Total income to Dec. 31, 1878.....	\$9,411,268.11

## COST OF WATER WORKS.

Total cost of water works to Dec. 31, 1878, including all work in progress.....\$8,431,023.40

## MEANS BY WHICH WORKS WERE PAID FOR.

Water loan bonds, 6 per cent., out-standing .....	\$622,000.00	
Water loan bonds, 7 per cent., out-standing .....	3,625,000.00	
Water loan bonds canceled .....	568,000.00	
One mill tax for 1871 .....	289,746.47	
One mill tax for 1872 .....	284,197.43	
Appropriation for 1873 .....	400,000.00	
Appropriation for 1874 .....	533,705.14	
Appropriation for 1875 .....	220,000.00	
Appropriation for 1876 .....	391,865.19	
	<hr/>	
	\$6,934,514.23	
Less rebates on tax .....	30,778.05	
	<hr/>	
	\$6,903,736.18	
From water rents .....	1,527,287.22	
	<hr/>	
		\$8,431,023.40

## WATER RATES.

The water rent collections for the past year present a very encouraging and satisfactory result, leaving a credit to the water fund, after paying all running expenses, salaries, and interest on water bonds, a surplus of \$81,576.76.

The following table exhibits the amount of water furnished and the revenue received annually by the city, from the year 1858 to the present date :

YEAR.	Million gal- lons furnished.	REVENUE.	Revenue per million gallons.
1858.....	1,092	\$102,178 85	\$98 57
1859.....	1,415	122,753 50	86 70
1860.....	1,717	131,162 73	76 39
1861.....	1,767	131,035 10	74 15
1862 (fifteen months).....	2,705	188,448 25	85 00
1863.....	2,836	192,246 39	82 29
1864.....	2,523	224,902 57	89 14
1865.....	2,778	253,114 49	91 11
1866.....	3,169	302,017 59	95 30
1867.....	4,232	338,929 28	80 08
1868.....	5,375	420,686 94	78 26
1869.....	6,801	476,968 24	70 13
1870.....	7,945	539,180 19	67 86
1871.....	8,423	445,834 64	52 93
1872.....	10,051	544,465 90	54 17
1873.....	11,723	708,804 32	60 46
1874.....	13,903	705,926 64	50 77
1875 (nine months).....	10,957	635,996 54	58 04
1876.....	15,346	771,940 88	50 30
1877.....	19,047	908,509 64	47 70
1878.....	19,564	944,190 97	48 31

## CONDENSED STATEMENT OF RECEIPTS AND EXPENDITURES.

## RECEIPTS.

Income from water rents. . . . . \$944,190.97

## EXPENDITURES.

Expense of running North Side

Pumping Works..... \$68,796.33

Expense of running West Side

Pumping Works..... 54,130.45

Office expenses and salaries..... 47,161.86

Expense of Water Meters,..... 14,235.51

Repairs of pipes, stop-cocks and  
miscellaneous operating ex-  
penses..... 35,426.83

For 307 \$1,000 bonds purchased... 307,000.00

Amount carried forward.....

\$526,750.98

Amount brought forward.....	\$526,750.98	
Water service cocks.....	7,124.36	
Lake Tunnel Crib.....	13,220.07	
Inlet basin.....	11,326.81	
Hydrants.....	18,064.90	
Interest on bonds.....	315,985.25	
		\$892,472.37
Surplus for 1878, including the purchase of 307 Water bonds....		\$51,718.60

## WATER METERS.

The following table shows the number of meters added during the past year, together with those in use prior to that time:

SIZE OF METERS.	$\frac{1}{2}$	$\frac{3}{4}$	1	1 $\frac{1}{2}$	2	3	4	Total
Number in use Dec. 31, 1876.....	377	.....	647	171	107	141	3	1446
Number of new meters added.....	112	.....	52	.....	.....	13	..	177
Total number in use Dec. 31, 1877	489	.....	699	171	107	154	3	1623
Number new meters added, 1878..	115	56	62	1	10	21	..	265
Number in use Dec. 31, 1878.....	604	56	761	172	117	175	3	1888

The quantity of water measured by meters during the year 1878 was:

North Division.....	261,916,000
South Division.....	1,405,630,750
West Division.....	595,037,500
Total.....	2,262,584,250

Number of water engines in use Dec. 31, 1877.....	132
Number engines added during 1878.....	10
Total.....	142

The number of gallons of water measured during the year is 325,851,750.

The amount collected for use of water measured by meters and water engines for the year is \$226,234.10.



## WATER RATES.

In considering a reduction of the water rates, it is proper to take into account the large outlay the city will soon be forced to make in the further extension of water mains and furnishing additional pumping facilities, the daily consumption of water already reaching to nearly the full pumping capacity of our engines, as may be seen by referring to the report of the City Engineer.

Believing that the water supply of the city should produce a sufficient annual revenue to provide for the construction and maintenance of its entire works, and believing that any extended reduction in the present income from this source would result in great injury to the present financial condition of this important Department, I cannot consistently advocate a reduction in the water rates now in force. But, in order to meet a popular sentiment on this question, would suggest a modified form or mode of collecting such tax by fixing the water rates as now established, and deducting ten per cent. on such amounts as are paid into the city within thirty days from the date such tax becomes due, on all taxes paid within thirty days thereafter a discount of five per cent., and all taxes remaining unpaid after the expiration of sixty days from the date the tax became due the full amount of the assessment to be collected.

This regulation, if adopted, would leave each person to elect for himself as to whether or not he would avail himself of the benefit of a reduced water tax by the early payment of his assessment, and would undoubtedly place in the possession of the city a much larger collection at an earlier date, and at an expense below the present cost of collecting. The collections of the tax under meter measurement being monthly could not practically be applied to the regulations above referred to. Yet there exists such a discrepancy in the cost of water for domestic use between the tax established under the usual form of assessment, and the rate charged through meter measurement that in equity to this class of water takers the meter rates should be

so adjusted that, while the increased rates should not discourage the use of the meter, the cost of supply to each class should be fixed upon the basis of equality. By an adjustment of the water rates as suggested, there would be established a uniform or equitable proportion of the cost of furnishing water for domestic use under both forms of supply without seriously decreasing the revenue the city receives from the present system of assessing and collecting. To consumers who receive their supply through meter and are using large quantities of water daily for manufacturing and other purposes, it seems not only justice to such consumers, but the city's interest requires the establishment of a rate of tax which will in no way cripple or discourage the manufacturing, mercantile, or industrial enterprises of our citizens.

#### LAKE TUNNEL CRIB.

The safety and permanency of the Lake Tunnel Crib—the receptacle of water passing through eight miles of lake and land tunnels, and through nearly 430 miles of main water pipes, which distribute daily about 55,000,000 gallons to consumers—is of such vital importance to the water supply of the city, that it is not surprising that the thoughtful should at times manifest some anxiety as to the probable future of this structure. To the minds of those having the supervision and care of this important trust, the improvements which have been added during the past two years have so fortified it against any tendency to weakness or insecurity, that its ability to withstand the powerful force of the elements has been definitely established. The provision against a possibility of the water supply being limited or entirely cut off by the collection of ice around the crib as described on page 61 of the Second Annual Report is capable of furnishing all the water required by the city independent of any other source of supply.

## SEWERAGE.

It is with deep sorrow that the death of William H. Clarke, Esq., late principal Assistant City Engineer is recorded. It occurred after a brief illness on the sixth day of August last. The deceased had been connected with the Chief Engineer's Department for more than twenty-three years, and during fifteen years of the time in charge of the sewerage system of the city.

His labors in this capacity began with the early history of Chicago, and were closely identified with the successful engineering enterprises, which have given our city a high position in the scientific world. His sterling integrity and untiring zeal and energy in the prosecution of professional labors commanded the admiration and esteem of all, and in closing a life of constant toil, he leaves behind him a record of rare moral and scientific excellence.

The office thus made vacant was provided for by the appointment of Mr. Benzette Willams on the 13th day of August, 1878. Having for six years been prominently connected with the City Engineer's Department, and possessing a high order of ability, he is eminently fitted for the responsible duties of the office.

There were constructed during the past year 88,031 lineal feet, or  $16\frac{3551}{5280}$  miles of sewer, at a cost, including advances refunded and material on hand, of \$160,453.75. There remains to be constructed on contracts already awarded 31,156 lineal feet, the cost of which is estimated at \$45,165.10, making the sewerage of the city now completed and under contract equal to  $300\frac{3360}{5280}$  miles.

The following statement will show the amount of sewers constructed during the past year in the different divisions of the city, together with the diameter of the same :

North Division.....	9,798 feet.
South Division.....	29,783 "
West Division.....	49,450 "
Total...	88,031

28,796 lineal feet.....	1	ft. diameter.
10,488 " " .....	1 1/4	"
31,901 " " .....	2	"
4,698 " " .....	2 1/2	"
3,613 " " .....	3	"
741 " " .....	3 1/2	"
2,397 " " .....	4	"
3,467 " " .....	4 1/2	"
1,526 " " .....	5 1/2	"
404 " " .....	6 1/2	"

Total 88,031 lineal feet laid during the year.

Amount laid previous to December 31, 1877, 1,468,149 lineal feet, making a total of 1,556,180 lineal feet, or 294 miles 3,860 feet, laid to December 31, 1878.

The following table indicates the total amount of sewerage constructed, together with the cost of the same since the beginning of the system in 1855 :

DATE.	No. of Feet of Sewers Laid.	No. of Catch Basins Cons'd	No. of Man- holes Cons'd	No. of Private Drains Laid	Cost of Clean- ing Sewers and Catch Basins.	Total cost of constructing Sewers.
Prior to 1861, May 6	283,586	1,214	2,102	2,194	\$16,494 21	\$665,188 46
1862, Jan. 1	2,826	18	33	243	1,715 50	3,617 31
1863, April 1	15,678	72	66	365	4,897 21	57,264 51
1864, " 1	39,605	191	204	536	5,055 40	169,299 29
1865, " 1	25,021	189	183	512	9,364 68	87,221 48
1866, " 1	29,948	223	168	1,288	13,818 07	137,643 02
1867, " 1	48,127	327	271	3,722	28,445 16	225,564 53
1868, " 1	89,661	418	555	3,703	26,541 81	416,730 51
1869, " 1	47,841	480	293	3,261	26,954 06	197,152 92
1870, " 1	139,705	771	928	3,979	26,015 18	654 141 26
1871, " 1	78,166	626	468	5,187	21,464 30	258,664 70
1872, " 1	50,716	277	300	1,251	17,415 46	151,290 36
1873, " 1	47,842	245	341	1,435	21,484 16	173,255 78
1874, " 1	146,702	897	1,015	4,691	31,329 27	508,283 44
1875, " 1	222,322	1,054	1,474	6,292	39,929 57	531,446 88
1875, Dec. 31	120,971	968	789	3,365	32,098 23	342,332 89
1876, " 31	15,248	155	75	1,172	29,345 41	79,545 28
1877, " 31	64,666	363	431	1,822	35,729 88	129 081 40
1878, " 31	88,031	492	603	1,544	25,704 37	180,453 76

## REPAIRS.

The cost of repairing sewers and catch-basins, and of removing and repairing man-holes and their covers, has been for the year \$11,701.97.

## PRIVATE DRAINS.

The number of private drains connected with the public sewers for the year are as follows :

North Division.....	347
South Division.....	406
West Division.....	791
Total.....	<u>1,544</u>

The receipts for the year for private drain permits have been \$9,029.63.

## SEWERAGE EXPENSE, REPAIRS AND INTEREST.

Salaries, office and miscellaneous expenses.....	\$6,169.11
Repairs North Division.....	1,263.01
“ South Division.....	2,691.39
“ West Division.....	5,737.57
Cleaning, North Division.....	5,594.93
“ South Division.....	9,233.05
“ West Division.....	10,876.39
Street intersections.....	9,567.52
Interest.....	216,590.46
Sinking Fund.....	1,000.00
House Drains.....	8,161.98
Stock account.....	300.06
	<u>\$277,185.47</u>

## SEWERAGE LOAN BONDS.

Six per cent. bonds outstanding Dec. 31, 1878....	\$80,000.00
Seven per cent. bonds outstanding Dec. 31, 1878.	254,300.00
Total.....	<u>\$2,623,000.00</u>

## SEWERAGE SINKING FUND.

Amount of money in the hands of the City Treasurer, Dec. 31, 1878, not applied to can- celing .....	\$41,857.66
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## STREETS.

During the past year there have been over eleven miles of streets improved, of which over nine miles have been laid with wooden block pavement, and about two miles finished with macadam, stone and cinders, making a total of one hundred and thirty-three miles of streets improved in the city at the present date.

The streets paved during the past year have been mainly those located in the business portion of the city, and the improvements thus made have taken the place of old and worn out pavements which had long been an obstruction and hindrance to the travel and traffic on our streets. It is expected that the coming year will add largely to the list of streets repaired, which will not only be of great advantage to business, but will improve the general appearance of this portion of the city.

No material change has been made of late in the mode of paving with wooden blocks, the present method being such as to secure the greatest possible service from such material.

## THE RIVER.

The continued high water has rendered it unnecessary to do any great amount of dredging during the past year, but the gradual decline of lake and river during the latter part of the season of navigation up to the close of the year, together with

the large accumulation of material from the drainage of sewers and other sources, filling the bed of the river during this long term of high water, indicates that the coming summer will require the expenditure of a large amount of money for dredging purposes to allow unobstructed navigation of the river and its branches, particularly for the larger class of grain and lumber vessels now entering our harbor.

The importance of this work is so essential to the interests of navigation and commerce that the judicious expenditure of a sufficient sum of money annually to render the channel of the river navigable under all circumstances, would be not only justifiable, but is indispensable to the prosperity of the city.

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#### FULLERTON AVENUE CONDUIT.

The city failing to enter into an agreement with the owners of property upon which to erect the buildings, machinery, &c., for operating the conduit, has applied to the Courts for possession of the land under condemnation proceedings, which may not delay the completion of the work very much beyond the early part of the coming season. Plans and specifications have been prepared and the department will, at an early day advertise for the erection of buildings, chimney, machinery, and the construction of dock and all appurtenances necessary in operating the conduit.

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#### VIADUCTS.

On the 10th day of May, 1878, proposals were received by this department for the construction of a viaduct over the tracks of the Pittsburgh, Fort Wayne and Chicago, and the Chicago, Alton and St. Louis Rail Roads at Eighteenth street.



For the erection of the superstructure a contract was entered into with the Keystone Bridge Company under date of August 3rd, 1878, to be completed in December of the same year, for the sum of \$11,194.00. A contract was entered into with James Clowry, dated August 3rd, 1878, for constructing and completing the substructure, to be completed in December of the same year, costing the sum of \$15,215.16; the total cost of the whole work being \$26,409.16. Of this amount the P., Ft. W. & C. R. R. Co., under an agreement with the city, dated March 30th, 1878, paid on account of said improvement, \$14,000, leaving the total expense to the city \$12,409.16.

This structure was opened to public travel late in December, which completes the seventeenth viaduct in the city, all of which are very important improvements, affording not only safe but unobstructed travel across the tracks of the various railroads entering our city.

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### BRIDGES.

Very little has been expended in the construction of bridges in comparison to former years.

In September last the city entered into an agreement with the Town of Lake View to build jointly a pivot bridge across the north branch of the Chicago River at the north city limits, (Fullerton avenue,) the city to pay two-thirds and the Town of Lake View one-third of the cost of the improvement.

Proposals were received and a contract, dated October 1st, 1878, was entered into between the city and Messrs. I. W. Savin and Co., to build the bridge at an expense to the city of two thousand nine hundred and seventy-seven dollars and fifty cents.

This improvement was much needed and will afford an important outlet to a large and increasing population in that portion of the city and town



In addition to the ordinary yearly repairs there has been expended about one thousand dollars in painting those of the bridges most needing it. An equal amount could be profitably applied the coming summer for the same purpose.

### NEW CITY HALL.

In order to continue the erection of the new city hall after the completion of the sub-basement, the City Council authorized the Department of Public Works, in connection with the Building Committee of the City Council, to contract for the masonry, cut stone and iron work, in the passage of an ordinance, dated March 18th, 1878, as follows:

*Be it ordained by the City Council of the City of Chicago:*

SECTION 1. The Department of Public Works, in connection with the Building Committee of this Council, is hereby authorized, as soon as the plans and specifications of the City Hall are completed, to advertise for bids for the mason, cut stone and iron work for the City Hall building, and to let the contract or contracts therefor to the lowest responsible bidder or bidders.

In compliance with this ordinance the Department of Public Works, in connection with the Building Committee of the City Council, on the 30th day of March, 1878, advertised for, and on the 15th day of April received proposals for cut stone, masonry and iron work necessary in the construction of the new City Hall, resulting in awarding and executing contracts April 17th, 1878, as follows:

Messrs. Thomlinson and Reed for cut stone.....	\$477,693 00
Mr. John Angus for masonry.....	90,519 00
Mr. P. J. Sexton for iron work.....	105,302 69

In addition to the above, contracts have been let for work connected with the construction of the new city hall up to the close of the present fiscal year as follows:

John Sackley excavating for foundations.....	\$1,483 62
Mortimer & Tapper, foundation and sub-basement	57,909 03
Denier & Robinson for prisoners cells.....	1,500 00
H. A. Milligan, painting iron work.....	572 30
McKinney & Doyle, excavating for foundations under the then Board of Public Works in the year 1875.....	3,600 00
Total amount of work contracted for.....	\$738,579 64

The following tables show the amount of money paid on contracts, and for miscellaneous work, materials, etc., not under contract :

Amount paid out for labor and material under contract—

McKinney & Doyle, for excavating Court House Square .....	\$3,600.00
John Sackley, for excavating for foundations.....	1,483.62
Mortimer & Tapper, for foundations and sub-base- ment .....	57,909.03
Denier & Robinson, for prisoners cells.....	1,500.00
H. A. Milligan, for painting iron work.....	572.30
John Angus, for brick work.....	18,106.49
P. J. Sexton, for iron work.....	25,107.67
Thomlinson & Reed, for cut-stone work.....	61,193.76

Total amount paid on work under contract. \$169,472.87

Amounts paid for labor and materials furnished not under contract :

Constructing sewers.....	\$281.15
Advertising and Printing.....	120.50
Iron, hardware and cell gratings.....	230.27
Earth filling and grading.....	488.80
Lumber for area coverings and sundry purposes..	529.73

Drawing materials, stationery and printing.....	69.05
Felting.....	21.72
Brick work, extra.....	249.20
Stone work, extra.....	121.50
Plans, elevations, sections, details, etc.....	4,000.00
Salary for Superintendent, draughtsmen, laborers, etc.....	5,091.48
Excavating and cutting off piles.....	285.85
Building coal vaults.....	288.03
Iron work, extras.....	446.00
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Total amount paid on work not under con- tract.....	\$12,219.28
Total amount paid on construction of City Hall under contract, with miscellaneous work and material not contracted for....	\$181,692.15
This does not include a reserve of 15 per cent. on estimates issued on work done under contract for brick, iron and cut-stone work, amounting to.....	18,424.93
Making the total cost of construction to Dec. 31, 1878.....	\$200,117.08

This expenditure completes the stone, iron and brick work in the foundations, sub-basement, basement, and one-fourth of the main story, placing in position 2,644 cut-stone, 2,700,000 bricks, and 770,000 pounds of wrought and cast-iron.

The work of construction upon the walls of the sub base-ment commenced on the 10th day of July and ended on the 17th day of December, 1878.

While there have been, to some extent, unavoidable delays in prosecuting the work of construction during this time, the walls of the structure have reached a height equal to the expectations of the Department. The building, so far as completed, offers positive evidence of ability and watchfulness on the part of the Architect, Mr. L. D. Cleaveland, in all the details of its construction, presenting, as it does, the appearance of ade-

quate solidity, durability and architectural taste and skill. A continuance of the policy thus far pursued in the construction of the City Hall will insure its completion at an expense, which the most judicious economy and closest competition in prices for labor and material will procure, giving to the city a public building on which no extravagant expenditure of the public money has been lavished, or the funds appropriated for its construction misapplied.

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#### PARKS.

A limited appropriation, being merely sufficient to preserve in ordinary condition the improvements already made in the various parks under the management of this Department, precludes the possibility of adding anything to them of a substantial or ornamental character, and, therefore, they present substantially the same appearance as in previous years.

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#### SIDEWALKS.

During the past year over eight miles of side walks have been laid, making in connection with walks formerly built, a total of over seven hundred and twelve miles.

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#### EXPENDITURES.

The following is a condensed statement of the amount expended from various funds for the construction and maintenance of Public Works under the control of this Department during the past year :

## WATER FUND.

Water pipe extension.....	\$77,617.77
North Pumping Works—shop.....	68,796.33
West Pumping Works.....	54,130.45
Office expenses and salaries.....	47.161.86
Water Meters.....	14,235.51
Repair of pipes, hydrants and miscellaneous operating expenses, including 307 \$1,000 bonds purchased and canceled.....	342,426.83
Water service cocks.....	7,124.36
Lake Tunnel Crib.....	13,220.07
Inlet Basin.....	11,326.81
Hydrants.....	18,064.90
Interest.....	315,985.25
	<hr/>
	\$970,090.14

## SEWERAGE FUND.

Office expense—salaries.....	\$6,169.11
Street intersections.....	9,567.52
House drains.....	8,161.98
Stock account.....	300.06
Repairs, Sewers, North Division.....	1,263.01
“ “ South Division.....	2,691.39
“ “ West Division.....	5,737.57
Cleaning sewers, North “.....	5,594.93
“ “ South “.....	9,233.05
“ “ West “.....	10,876.39
Sewerage Sinking Fund.....	1,000.00
Interest.....	216,590.46
	<hr/>
	\$277,185.47

## SEWERAGE TAX FUND.

Ward 1.....	\$333.76
“ 3.....	1,176.14
“ 4.....	30,844.43
“ 5.....	15,567.39
“ 6.....	24,514.30

Ward 7.....	4,126.43
“ 8.....	821.78
“ 9.....	41.23
“ 10.....	154.58
“ 11.....	5,020.62
“ 12.. ..	24,628.96
“ 13.....	2,308.44
“ 14.....	23,107.79
“ 15.....	10,387.21
“ 16.....	1,763.15
“ 17.....	42.20
“ 18.....	66.88
Miscellaneous expense.....	94.00
Covers account.....	415.09
Pipes account.....	11,863.72
Brick account.....	3,173.65
	<hr/>
	\$160,453.75

## APPROPRIATION FUND.

North Division streets.....	\$25,459.93
South “ “ .....	44,780.03
West “ “ .....	65,762.94
Sidewalks, North Division.....	1,031.06
“ South “ .....	1,100.47
“ North “ .....	1,950.54
Office expense and salaries... ..	14,975.07
Old City Hall.....	4,005.57
Washington Park.....	483.30
Ellis “ .....	701.25
Lake “ .....	1,544.76
Union “ .....	1,484.20
Jefferson “ .....	754.78
Vernon “ .....	864.50
Wicker “ .....	667.12
Washington Tunnel.....	2,171.09
LaSalle Tunnel.....	1,368.87
Public benefits.....	97,451.67

Harbor.....	2,775.70
Street lamps.....	1,762.30
Bridge Tenders Salaries. ....	28,670.00
Bridge Department.....	19,333.52
Fullerton Avenue Bridge.. ....	1,955.00
North Avenue Bridge.....	2,899.00
Street Permits.....	1,431.23
Eighteenth Street Viaduct.....	17,196.56
Milwaukee Avenue Viaduct.....	5,843.00
Fullerton Avenue Conduit.....	50,768.45
Ogden Ditch Dam.....	35.00
Certificates of Indebtedness.....	7,000.00
Interest on Certificates of Indebtedness.....	3,330.83
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	\$419,557.74

### CONCLUSION.

On the 18th day of December, 1876, by an ordinance of the City Council, the office of the Board of Public Works was abolished and the duties thereof vested in the Mayor of the City.

The power thus delegated was in force until the 30th day of December, 1878, being the close of the past fiscal year, at which time the City Council passed an ordinance establishing a Department of Public Works, placing at its head one Commissioner, thus relieving the Mayor from any direct responsibility of the management of this Department after such date.

During the term above referred to the policy pursued has been to enforce such a system of economy in the expenditure of money appropriated for the use of this Department as to be in harmony with the general depressed financial condition of the times, doing such work and making such public improvements only as were indispensable to the general welfare of the city,



and to bring the cost of the same within the limited ability of the city and citizen, and thus avoid, as far as possible, inflicting upon either burdensome taxation or hopeless indebtedness.

The improvements which have been thus temporarily delayed must soon force their completion upon the public, necessitating a great outlay of money in the construction of sewers, laying of water mains, improvements of streets, and providing the means for a larger daily supply of water. These are required, not only by the ordinary increase of population and general growth of business, but by the extensive manufacturing and mechanical interests, which are increasing yearly in magnitude, furnishing employment for thousands and drawing around them a large, intelligent and industrious population, contributing largely to the wealth and thrift of our city. We cannot estimate too highly the importance of extending to such industries every facility which will encourage their growth and contribute to their prosperity.

The amount expended in constructing and maintaining the public works of the city has, under a depressed market for material, the low price of labor, and the sharp competition of contractors, enabled the Department to accomplish much more during the year than was anticipated, and with a quality of improvements which are highly satisfactory. With returning prosperity in the financial condition of our people the prosecution of more extended public improvements will be justifiable, and, indeed, it would be quite inexcusable to unnecessarily delay the pavement of such business thoroughfares as have remained so long in a condition, at times, unfit for public use, and always discreditable to the city. It is to be hoped that, at an early day, the improvement of driveways leading from the business centre and connecting with the parks and boulevards which ornament the boundaries of our city, will be so completed as to afford an attractive and desirable outlet to those seeking rest and retirement.

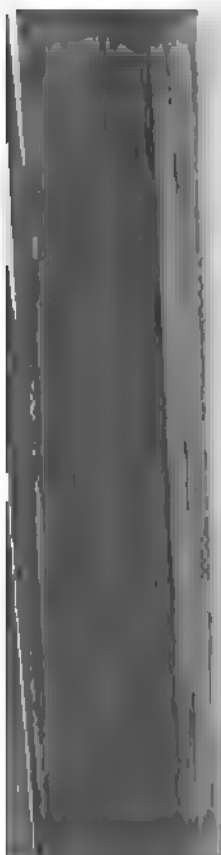
In retiring from the active duties of this branch of the City Government, I take pleasure in extending to the officers and

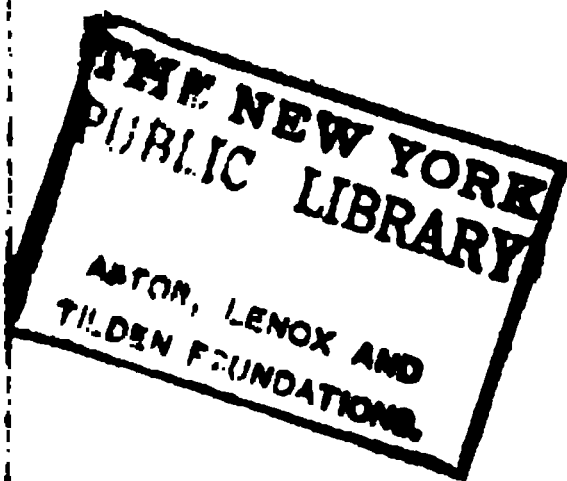


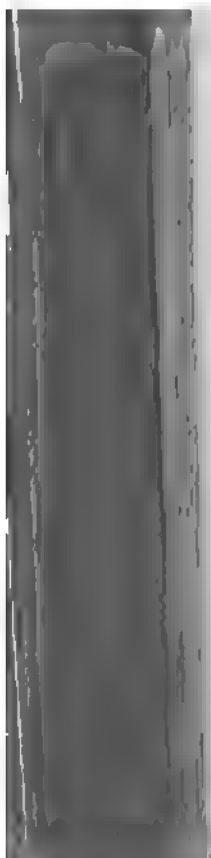
heads of Departments my highest appreciation of their cordial and efficient support while in charge of this Department, and to whose reports I would respectfully refer for a detailed statement of the work performed during the past year.

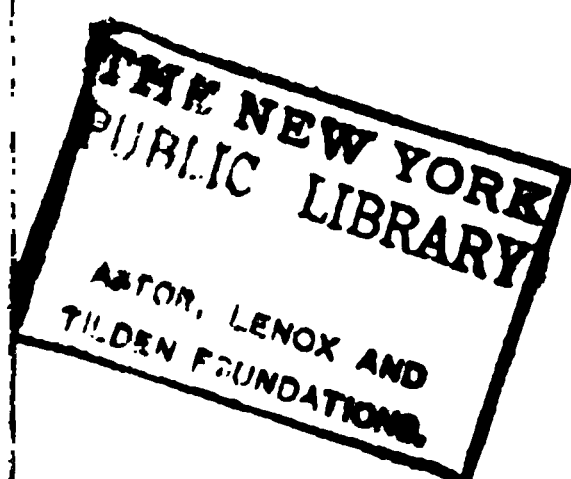
MONROE HEATH, *Mayor.*

*In charge of the Department of Public Works.*











# CITY ENGINEER'S REPORT.

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CHICAGO, 1879.

*Hon. Monroe Heath, Mayor.*

SIR :—The City Engineer in presenting his report for the year ending December 31st, 1878, would follow the order of previous annual reports, by beginning with the operations at the pumping stations.

REPORT OF THE ENGINEER OF THE PUMPING  
WORKS.NORTH PUMPING WORKS, }  
CHICAGO, APRIL 1st, 1879. }

E. S. CHESBROUGH, Esq.,

*Commissioner of Public Works.*

SIR :—The following pages embrace a record of the operations of these works since the date of last report, and constitute the twenty-sixth annual report, the same being for the year ending December 31st, 1878.

The total quantity of water pumped, with an allowance of  $5\frac{3}{4}$  per cent. for loss of action in pumps, is 11,145,370,232 gallons.

The daily average quantity pumped during the year 1877 slightly exceeded  $32\frac{3}{4}$  million gallons. The greatest daily average for a single month during that year, was in May, viz: nearly  $37\frac{1}{4}$  million gallons.

The daily average for the past year is a trifle over  $30\frac{1}{2}$  millions, while the greatest daily average for a single month was in November last, viz:  $38\frac{1}{4}$  million gallons.

The exact quantities are given in the accompanying tables, which are exclusive of the quantities pumped at the "West Works." The tabulated record will also show in detail the operations of engines and boilers during the year 1878.



# OPERATIONS OF ENGINES AND BOILERS.

MONTHS, 1878.	No. of Days	No. of hours run per Month. H. M.	Av. No. of Revol- utions per day	Total Revol- utions per Month.	Av. No. of gal- lons of water pumped in month less 5% per cent allowed for loss of action.	Total No. of gal- lons of water pumped in month less 5% per cent allowed for loss of action.	Av. No. of gal- lons of water pumped in day less 5% per cent allowed for loss of action.	Pounds of coal consumed per month for pumping.	Av. No. of pounds of coal con- sumed per day for pump- ing.	No. of pounds of coal con- sumed per month. changed boilers	Total lbs of coal con- sumed per month.
January .....	31	744:00	24:00	445,549	14,375	808,314,008	28,977,902	1,482,470	47,821	5,100	1,487,570
February .....	28	672:00	24:00	406,135	14,504	815,598,987	29,128,535	1,353,080	48,324	5,600	1,358,680
March .....	31	744:00	24:00	475,380	15,334	906,047,019	29,227,328	1,409,920	47,416	8,200	1,478,120
April .....	30	720:00	24:00	459,861	15,328	886,000,042	29,533,365	1,185,370	39,512	5,500	1,190,870
May .....	31	744:00	24:00	730,998	23,580	639,630,064	20,633,228	1,260,000	40,647	4,900	1,264,900
June .....	30	720:00	24:00	602,231	20,074	724,020,984	24,134,033	1,370,790	45,693	5,100	1,375,890
July .....	31	744:00	24:00	592,719	19,119	1,114,216,563	35,619,889	1,928,100	62,200	7,000	1,935,790
August .....	31	744:00	24:00	593,183	19,135	1,122,492,614	36,200,439	1,933,050	62,350	2,000	1,935,050
September .....	30	720:00	24:00	537,387	17,912	1,050,831,450	35,027,722	{ + 413,390 * 1,511,520	64,807	8,800	1,555,710
October .....	31	744:00	24:00	541,818	17,478	1,064,588,732	34,341,572	{ + 1,229,220 * 1,084,610	74,639	4,700	2,318,630
November .....	30	720:00	24:00	611,197	20,373	1,145,357,795	38,178,629	{ + 1,694,140 * 947,049	87,972	4,700	2,643,880
December .....	31	744:00	24:00	557,463	17,982	1,078,271,910	34,782,065	{ + 1,297,730 * 1,131,850	80,286	2,500	2,491,380
Total .....	365	8,670:00	.....	6,753,991	.....	11,145,370,232	.....	{ + 4,634,280 * 16,737,450	.....	65,200	21,437,030
General average per month .....	.....	730:00	.....	582,832	.....	928,780,852	.....	1,780,977	.....	5,440	1,786,420
General average per day .....	.....	24:00	.....	18,504	.....	30,535,261	.....	.....	58,532	179	58,781

NOTE—Coal for heating building, etc., included in above amounts + Screenings. \* Lump coal.

The proportion of the entire pumping capacity used during the past year was a little less than that used the year previous, as the largest engines were out of service due to a general overhauling for a period of more than two months.

The annexed table sets forth the total quantity of water pumped and the time run by the several engines respectively.

ENGINES DESIGNATED AS.	HOURS AND MINUTES.	TOTAL REVOLUTIONS	Total Gallons of Water pumped less 5% per cent for loss of action.
1858.....	H. M. 48 45	25,870	12,416,112
1857.....	1,711 58	1,088,857	795,486,884
1867.....	4,480 80	2,518,775	2,898,818,260
1872.....	6,810 15	8,176,489	7,944,198,976
Totals .....	12,996 28	6,758,991	11,145,870,282

#### FUEL.


Coal has been received and used as follows :

#### LACKAWANNA COAL.

	TONS.	POUNDS.
On hand, Jan. 1st, 1878.....	288	1,720
Received.....	8,610	1,810
	TONS.	POUNDS.
Used for pumping, heating building, etc., etc.....	8,351	1,340
Used for work shop.....	175	80
On hand Jan. 1st, 1879.....	373	110
Total .....	8,899	1,530
	8,899	1,530

## ERIE COAL.

		TONS.	POUNDS
On hand Jan. 1st, 1878.....		7	280
Received .....		138	740
Used for pumping, heating build- ing Lake Basin, etc.....	103	1,370	
Used for work shop and pipe extension .....	36	1,230	
On hand Jan. 1st, 1879..	5	420	
Total.....	145	1,020	145 1,020

 The screenings referred in the tables was used as an experiment, under a special contract. The result of which was submitted to you several months since.

## EXPENSES DUE TO PUMPING

Salaries of engineers.....	\$6,840.00
Labor, firemen, etc.....	12,490.79
8,351 $\frac{1}{2}$ $\frac{840}{1000}$ tons of Lackawanna coal at an average cost of \$4.89 $\frac{6}{10}$ per ton.....	40,892.70
17 $\frac{110}{1000}$ tons of Erie coal at an average cost of \$4.78 $\frac{6}{10}$ per ton.....	83.60
495 $\frac{1}{2}$ gallons of lard oil.....	347.08
324 $\frac{1}{2}$ gallons of cylinder oil.....	270.55
26 $\frac{1}{2}$ pounds of lubricating compound.....	10.60
145 $\frac{1}{2}$ " " tallow.....	14.05
934 $\frac{2}{4}$ " " waste.....	88.99
323 $\frac{2}{4}$ " " packing.....	140.27
Labor, etc., cleaning engines.....	70.60
Small stores.....	85.71
Gas for lighting works, (for first 5 months only)....	502.92
Repairs of fire room tools .....	42.90
Repairs of boilers.....	262.49
Repairs of engines.....	1,398.66
Cost of pumping by special contract.....	6,031.91
Total.....	\$69,573.82

Cost of delivering water per million gallons.....	\$6.24 <sup>24</sup> <sub>100</sub>
Cost of repairs and additions per million gallons....	.14 <sup>90</sup> <sub>100</sub>

## DISTRIBUTED AS FOLLOWS:

To engines.....	.12 <sup>55</sup> <sub>100</sub>
To boilers.....	.02 <sup>35</sup> <sub>100</sub>
Subdivided as follows:	
Additions and extraordinary repairs of engines.....	.01 <sup>91</sup> <sub>100</sub>
Ordinary repairs of engines.....	.10 <sup>54</sup> <sub>100</sub>
Repairs of boilers.....	.02 <sup>35</sup> <sub>100</sub>

The following is the cost of delivering water per million gallons during the past ten years, and cost of coal:

	Average cost of coal per ton.	Cost per million gallons
1870.....	\$6.93	\$11.71
1871.....	6.49	11.31
1872.....	8.09	12.02
1873. ....	7.18	11.64
1874.....	8.56	12.86
1874-5.....	8.27	12.26
1875, (nine months only).....	7.93	10.81
1876.....	7.15	9.56
1877.....	5.38	7.09
1878, (estimated) screenings used.....	4.39	6.24
	<u>\$7.04</u>	<u>\$10.55</u>

The quantity pumped each month for the past ten years is as follows:

TABLE SHOWING QUANTITY OF WATER PUMPED AT THE "NORTH PUMPING WORKS" EACH MONTH DURING PAST TEN YEARS.

MONTH.	1868-70	1870-71	1871-72	1872-73	1873-74	1874-75	1875.	MONTH.	1876	1877.	1878.
April	815,558,636	601,250,394	710,000,000	696,417,536	916,320,417	969,283,610	1,240,657,677	January	1,206,668,563	719,462,385	808,314,068
May	641,024,720	628,284,477	713,000,000	728,520,298	901,025,980	1,441,172,222	1,256,607,063	February	1,169,288,839	774,094,448	816,598,087
June	637,020,771	770,501,030	735,000,000	748,958,470	806,614,146	1,010,002,223	1,163,986,505	March	1,244,271,228	1,088,621,780	900,047,013
July	641,350,425	760,072,800	800,000,000	876,306,981	1,000,630,844	1,267,643,064	1,229,434,124	April	1,199,825,583	1,109,008,810	650,070,942
August	625,549,074	787,000,274	808,000,000	822,376,814	1,033,164,840	1,352,446,047	1,272,876,920	May	1,300,577,101	1,154,372,813	639,630,964
September	592,373,233	751,256,530	750,00,000	842,608,566	873,690,023	1,246,442,604	1,169,570,888	June	1,237,317,437	1,110,876,865	724,020,084
October	556,009,038	694,006,940	442,337,861	844,791,206	1,018,633,412	1,171,106,733	1,227,566,188	July	1,358,770,909	1,116,230,814	1,114,216,663
November	550,754,730	650,030,983	657,138,219	833,879,447	1,023,033,854	1,056,421,054	1,106,694,177	August	1,376,660,544	1,066,176,410	1,122,492,014
December	568,074,140	558,179,911	620,308,388	877,683,881	1,026,230,936	1,140,266,745	1,192,680,268	September	1,243,745,869	1,012,628,066	1,050,831,850
January	548,247,463	672,621,440	654,600,000	905,301,174	966,686,283	1,183,462,490	1,233,602,490*	October	1,268,071,044	898,713,776	1,064,689,733
February	528,713,115	647,677,127	668,788,000	838,244,790	884,813,692	1,136,005,231	1,136,005,231*	November	1,015,801,271	908,774,561	1,146,355,798
March	625,948,628	686,984,769	738,469,377	976,005,777	1,092,041,550	1,305,239,636	1,383,230,836*	December	869,709,283	899,697,884	1,078,271,910
Totals	6,801,146,720	7,944,648,840	8,433,820,000	10,056,309,189	11,752,819,032	13,903,197,493	14,642,920,263	Total	14,525,833,708	11,088,977,646	11,145,370,232

\*These three months' figures were borrowed from the previous year (the commencement of the municipal year having been changed,) in order to make up twelve months' work. They exceed the actual quantity pumped by 63,338,687 gallons, but if being leap year, there were twenty-nine days in February, besides which the new pumping works were in operation.

# TABLE SHOWING TOTAL QUANTITY OF WATER PUMPED AT THE NORTH PUMPING WORKS.

TOGETHER WITH ANNUAL AND DAILY INCREASE IN QUANTITY AND RATE PER CENT.

ALSO, THE GREATEST DAILY AVERAGE FOR A SINGLE MONTH, FOR THE FOLLOWING YEARS.

ENDING	YEAR.	Total Quantity pumped.	Annual Increase.	Average Daily Quantity Pumped.	Average Daily Increase.	Per Cent. of Annual Increase	Greatest Daily Average.	
		GALLONS.	GALLONS.	GALLONS.	GALLONS.		MONTH	GALLONS.
Dec. 31..	1858.....	1,091,865,459	.....	2,991,413	.....	.....	September .....	8,617,818
" 31..	1859. ....	1,415,147,910	323,282,453	3,877,119	855,706	29.60	October .....	4,565,388
" 31..	1860. ....	1,716,780,552	301,338,642	4,703,525	826,406	21.29	July .....	5,367,569
" 31..	1861. ....	1,767,154,989	50,368,437	4,841,520	137,995	2.93	August .....	5,438,790
Mar. 31..	1862. ....	2,217,279,730	450,125,030	6,074,739	1,233,219	25.47	July .....	6,748,899
" 31..	1863.....	2,338,108,454	118,128,715	6,460,988	325,550	5.32	January .....	6,770,483
" 31..	1864.....	2,923,339,218	187,230,764	6,913,279	512,461	8.01	August .....	8,293,850
" 31..	1865. ....	2,775,817,449	234,478,131	7,610,459	697,200	10.08	September .....	8,871,530
" 31..	1866. ....	3,168,762,009	390,944,250	8,681,556	1,071,077	14.07	July .....	10,022,164
" 31..	1867.....	4,231,791,659	1,063,029,650	11,562,273	2,800,737	33.64	March .....	12,453,112
" 31..	1868. ....	5,374,624,576	1,142,832,917	14,724,999	3,162,726	27.00	March .....	16,414,460
" 31..	1869. ....	6,801,146,720	1,426,322,144	18,633,278	3,908,279	26.54	July .....	20,689,014
" 31..	1870. ....	7,844,684,840	1,043,538,120	21,766,260	3,153,082	16.81	August .....	25,712,789
" 31..	1871. ....	8,423,890,956	579,206,116	23,464,877	1,698,617	6.03	August .....	28,000,000
" 31..	1872. ....	10,050,999,189	1,627,048,233	27,536,819	4,071,942	19.81	March .....	31,485,070
" 31..	1873.....	11,722,879,082	1,671,879,893	32,117,312	4,580,493	16.63	November. ....	34,121,128
" 31..	1874.....	13,901,197,493	2,180,378,461	38,040,462	5,973,640	18.69	March .....	43,717,404
Dec 31..	*1875. ....	10,957,262,996	773,722,760	39,844,556	1,753,604	7.24	April .....	41,461,262
" 31..	1876. ....	14,525,878,798	.....	39,989,138	.....	.....	August .....	44,406,696
" 31..	1877. ....	11,968,977,646	.....	32,764,323	.....	.....	*May .....	37,297,883
" 31..	1878. ....	11,145,370,232	.....	30,535,261	.....	.....	November .....	38,178,526

\*Compared with same months of the year 1864.

†Exclusive of quantity pumped by "West Works."

## SHOPS.

Hydrants, stop-valves, etc., have been manufactured during the year, as follows:

## NEW HYDRANTS.

Four inch (double nozzle).....	135
Two and a half inch (double nozzle).....	1
Two and a half inch (single nozzle).....	22
	<hr/>
Total manufactured.....	158
Of these there have been put in use.....	150
	<hr/>
On hand, January 1st, 1879, (4 inch).....	8

## NEW STOP VALVES.

Four-inch.....	88
Six-inch.....	100
Eight-inch.....	52
Twelve-inch.....	6
Sixteen-inch.....	5
Twenty-four-inch.....	1
	<hr/>
Total manufactured.....	252
Of this number there have been used.....	107
	<hr/>
Leaving on hand, January 1st, 1879.....	45
Of the following sizes, viz.:	
Four-inch.....	12
Six-inch.....	16
Eight-inch.....	14
Sixteen-inch.....	2
Twenty-four-inch.....	1
	<hr/>
Total.....	45

The above list includes the hydrants and valves reported on hand January 1st, 1878, which were carried over as "stock" on hand.

In addition to the foregoing work, a number of hydrants and stop-valves have been repaired, and the usual amount of repairing has been done for the various departments of the city.

The total expenditures for labor and material on account of shop, including value of stock on hand January 1st, 1879, is..... \$18,475.94

Charged to the following accounts, viz.:

Water department, "pumping".....	\$ 523.59	
Water department, operating expenses..	1,067.62	
New hydrants and stop valves.....	9,847.60	
Pipe extension.....	488.55	
Meter department.....	112.21	
Tapping department.....	117.75	
Sewer department.....	43.08	
Fullerton avenue conduit.....	28.29	
Stock Yard Tunnel (sounding tools)....	130.54	
Washington street tunnel.....	.27	
Lincoln park.....	.54	
Street department.....	104.08	
Lake park.....	.85	
McMullen, G. W.....	43.47	
Archer avenue tunnel.....	2.96	
Fire department, (coal, repairs, engines, etc.).....	671.61	
Expense running shop, coal, oil, gas, &c.	1,563.41	
Superintendence deducted from engineer's salary.....	360.00	
Stock on hand, January 1st, 1879.....	3,369.52	
		<hr/>
		\$18,475.94 \$18,475.94



The value of the work done in the shop, estimating the same at less than current prices for like articles is...	\$22,242.18	
Add coal, attendance, etc., used by fire department.	614.03	
Deduct cost as shown.....	\$18,475.94	
Deduct 10 per cent. for interest and depreciation of tools, &c., costing \$6,910.44	691.04	
Leaving the nominal net earnings of shop	3,589.23	
Total.....	\$22,756.21	\$22,756.21

Cost of tools previously reported.....	\$6,786.72	
Added by repairs past year.....	123.72	
Present value of tools.....	\$6,910.44	

Value of stop-valves and hydrants before noted, as on hand January 1st, 1879, together with the raw material in the shop is.....	3,369.52	
Total value of stock and tools.....	\$10,279.96	

Nothing in the way of repairs has been done to the shop building the past year. During the ensuing spring the exterior surface of walls and wood work will be painted.

#### THE ENGINES.

The oldest single engine, "53," has been in operation during the year a portion of six days only, running a little over 7 hours per day. It has not required any repairs, and is in as good condition as at date of last report.

The large single engine, "57," has been used about 12½ hours per day for 138 days. This engine has required no repairs beyond the usual renewal of packing, etc.

The North double engine, "67," has been in use 271 days, about 16½ hours per day. Since the refitting of pumps, as noted in last report, the engine has continued in excellent condition, working in a highly satisfactory manner. The only repair re-

quired was a new pillow block binder in place of one found to be broken. The portions of this engine below main floor have been painted.

The south double engine, "72," has been in operation 287 consecutive days and nights. It has received no repairs of consequence during the year, continuing as always to run smoothly and satisfactorily, and remains as "plumb" and rigid as could be desired.

By reference to prior reports it will be noticed that this engine has been in operation day and night a large proportion of the time since it was completed in 1872. No accident or breakage of any kind having occurred during such period, and with only such repairs as are due to ordinary wear. It has not been necessary to stop this engine more than once each year for the purpose of repacking, cleaning, etc. But now, after nearly seven years almost continuous service it is necessary to refit the pump valves and "true up" the interior surface of pumps. This work is now well under way, and will soon be finished preparatory to use during the ensuing warm season, other parts of the engine need only the usual attention.

#### PRESENT PUMPING CAPACITY.

The two double engines at the north works and the two single engines at the west works, are in reality the main reliance of the city for water, since the two single old engines at these works have become an insignificant factor in the supply, owing to their limited capacity in proportion to the present demand of the city.

It will be remembered one of these engines was erected to meet the requirements, when the works were established—twenty-six years ago, the other was erected four years after or twenty-two years ago. The lack of capacity of these old engines has long been anticipated, as will be seen by referring to former reports on the subject, but the matter has now become an established fact, and provision for the deficiency must soon be made in order to render the means of supply at all times ample and reliable.

The writer is aware that the necessity and importance of keeping the facilities of supply in prudent advance of the demand is a matter which has always engaged your official attention, hence the subject need not here be further discussed.

Early in the year a new air compressor was connected to the engines for the purpose of creating a suitable air cushion in the pumps, for the purposes mentioned in last reports.

#### BOILERS.

In the last annual report, mention is made of the size and condition of the several boilers in use at these works, to which your attention is again respectfully invited.

During the past year but \$262 have been expended for repairs on the boilers, equivalent to  $2\frac{1}{8}$  cents per million gallons of water pumped.

Three of the boilers are in "good" condition after a service of seven years. One has been in use nine years and is in "fair" condition, the other has been in operation much of the time for eleven years, from which service its condition is not so satisfactory as the others.

#### THE SUPPLY

during the year has been abundant, both as to quantity and "head," and without interruption, although some trouble was experienced, for several days in January of the present year, owing to an accumulation of ice at the crib, which stopped the free flow of water through tunnels to pump wells. The exigency however was promptly met by admitting the water from the shore through the supplemental inlet, which had been constructed in anticipation of the trouble that might arise from ice. This arrangement is convenient and affords an independent means for an ample supply of water whenever necessity requires.

In June last one of the 36 inch "mains" leading from the engine was cracked about three-fourths of its circumference,

near a connecting flange. The break occurred inside the building and was probably caused by the settling of a wall upon it. The crack was promptly repaired and has remained tight since.

#### BUILDING.

During the year the exterior surface of woodwork—doors and windows—was painted by the regular employes. No other work or repairs have been done, consequently the buildings, with the exception noticed, remain in same condition as at date of last report. The roof, however, continues as heretofore, to be a source of complaint and discomfort, owing to the leaky and dilapidated condition, and in wet or cold weather amounts to a nuisance.

#### THE TOWER

is in good condition. The standing pipe has received a coat of paint; also, the cupola and wood work. Beyond this nothing in the way of repairs to the structure is required.

#### THE GROUNDS

west of the main building are in good order. A number of large trees have been set in place of those which had become decayed. In summer this portion of the premises is rendered inviting to visitors, being kept in neat order and made attractive with floral embellishments through the kindness of the Lincoln Park Commissioners. No change has been made to the ground east of building except that a considerable portion of the old inlet basin has been filled up with ashes from the works.

The principal improvement that could be made east of the building is the construction of suitable coal houses, a matter which has been so often referred to.

A small bathing house has been placed on the shore, so arranged that the ejection water, having a temperature of about 100°, flows through it, and is used by any or all of the employes of the works.

#### MISCELLANEOUS.

The facilities for communicating by telegraph between the

west works, city buildings and crib, as noted in last report, have been greatly improved during the past year by the substitution of the telephone connecting the same points. This valuable instrument is of great practical importance to the works as it is now arranged, but it would be still more serviceable were it attached to the main lines of wire, so communication could be had with all accessible points, an improvement that would involve but little additional expense.

A small steam engine was put in operation at these works last spring, for the purpose of furnishing suitable power to drive a "generator" and test the practicability of using the electric light instead of gas. Extended experiment was made by those in charge of the matter with some measure of success. The apparatus was subsequently removed to another building for further experiment and the small engine, by order of the department, was sold.

The record of observations of the various tests made under your direction, during the year, to determine the flow of water through tunnels and loss of action in pumps, has been submitted.

A new automatic gauge for recording the head of water at all times has been attached to the mains and its working has proved satisfactory.

It is with peculiar regret that I have to report the recent death of William McAlpine Cregier, who for several years had faithfully and efficiently filled the position of assistant engineer at these works.

Assistant Engineers Trautman and Horner with others constituting the working force still remain in the active discharge of their duties.

Respectfully,

DEWITT C. CREGIER,  
*Engineer.*

WEST PUMPING WORKS, 1  
CHICAGO, March 1, 1879. }

E. S. CHESBROUGH, *City Engineer.*

SIR: The third annual report of the operations at these works, being for the year ending December 31st, 1878, is herewith submitted.

#### ENGINES.

Both engines have been in operation during the year with the exception of twelve days during the months of October and November, at which time they received a general overhauling and cleaning, which had not been done before since their erection, all working parts were found to be in good order, with the exception of the valves in the main pumps, which had to be replaced with new ones of a superior quality of rubber, which I think will give much better satisfaction. While we were working but one engine the head was very unsatisfactory, there were several complaints of the lack of pressure, which would prove that if one of these should become disabled, it would be a great inconvenience to the people of the West Side. More machinery at these works is what is really required for safety.

The total number of gallons pumped, as well as the general average per day, and other data belonging to the machinery will be found in the accompanying table.

#### BOILERS.

The boilers are in good order and are working satisfactorily. I have had four new feed water heaters made, the old ones having given out; two of these have been put in their respective places, the others will be attached when required.



In July last, Mr. McMullen was awarded the contract for furnishing coal for these works, the city contracting with him at a stated price per million gallons. The first coal that was sent to the works (Kingston) gave us a great deal of trouble and we were soon compelled to abandon it, being unable to keep up a pressure of steam requisite to operate both engines. Pittsburg nut was then tried with but little better success; Streater lump next with the same result; the tests with these coals were made with a natural draft, by this time "Mr. McMullen" had his device (a blower and patent grate bars) arranged, designed for burning screenings, but I found, after a short trial, that screenings were inefficient; after several experiments I found Streater nut to be the most economical, and which I have continued to use up to the present time.

#### GROUNDS AND BUILDINGS

are in much the same condition as stated in last report. I have caused some of the worst places in front of the building to be filled up with residue from the fire room. I continue to do what I can with the means at hand to improve the grounds. The roof of the fire room requires some repairs so as to prevent the water from dripping on the brick work around the boilers when it rains. I would suggest also that two or three ventilators be placed in the roof, as the dust and odor arising from the coal is very offensive when cleaning fires, particularly when the building is closed up during cold weather.

A new floor in the basement between the engines is a "necessity," there is nothing there at present but the old timber that was placed there when the engines were constructed. If the department could spare a few thousand dollars to improve the grounds around the building I think it would be judiciously expended.

Engineers Faron, Stewart and Hill, as well as all others constituting the force at these works have individually and collectively been prompt and efficient in the discharge of their respective duties.

Respectfully,

HENRY MASON, *Engineer.*

JANUARY 1st, 1879.

## WEST SIDE PUMPING WORKS.

## COAL ACCOUNT.

	TONS.	LBS.	COST.
Coal on hand Jan'y 1st, 1879:			
Erie coal.....	643	1,306	\$2,833.56
Lackawana coal.....	14	1,560	95.78
Received during the year 1879:			
Erie coal.....	2,994	1,620	13,421.21
Indiana block.....	50	0,000	187.50
Park county.....	54	1,695	165.10
Massillon coal.....	75	1,640	303.28
Laurel Hill coal.....	150	0,000	585.00
Total.....	3,983	1,821	\$17,641.43

## COAL USED.

	TONS.	LBS.
Erie coal.....	3.181	865
Indiana block.....	50	0,000
Park county coal.....	54	1,695
Massillon coal.....	75	1,640
Laurel Hill coal.....	150	0,000
Coal on hand Jan'y 1st, 1879:		
Lackawana coal.....	14	1,560
Erie coal.....	447	0,060
Used for water pipe extension, &c.....	10	0,000
Total.....	3,983	1,820

## EXPENSES DUE TO PUMPING.

Salaries of engineers, firemen, labor, etc.....	\$16,636.25
3,512 <sup>201</sup> / <sub>2000</sub> tons of coal at an average cost of \$4.69 <sup>78</sup> / <sub>100</sub> .....	16,498.16
Fuel furnished under McMullen's contract.....	7,420.28
842 <sup>1</sup> / <sub>2</sub> gallons lard oil.....	593.49



928 gallons cylinder oil.....	1,018.51
540 gallons lubricating compound.....	196.50
1,092 lbs. of waste.....	107.96
226 lbs. of tallow.....	22.60
290½ lbs. rubber and other packing.....	190.35
New tools, etc.....	117.50
One sett of patent grate bars.....	224.72
Repairs on boilers and engines.....	583.66
Fire brick and fire clay.....	508.51
New pump valves .....	939.34
Red and white lead.....	17.25
Small stores.....	110.18
Pipe and fittings.....	53.02
49½ gallons kerosene.....	12.38
Gas for lighting works.....	1,219.20
Total .....	<u>\$46,469.84</u>

Cost of delivering water per million gallons.....	\$51 <sup>45</sup> / <sub>100</sub>
Cost of repairs per million gallons.....	06 <sup>98</sup> / <sub>100</sub> cents

# OPERATIONS AT THE WEST PUMPING WORKS.

The following statements have been prepared from the records kept at the works

ENGINE NO 25.

Date. 1878.	Steam pressure	Vacuum.	Height of Water in feet	Revolutions	No of hours run.	Total revo- lutions	Coal burned for pumping, includ- ing but excluding pumping out dry well.	Total amt. of coal burnt for all purposes	Ashes.	U. S. gall. deliv- ered into city allowing 5% p. c. for loss of action, etc	(Tube feet of water fed into boilers	Temperature of flue-g. coal burned	Duty for 100 lbs. of coal burned
January ..	52	12 $\frac{3}{4}$	108 5	5	608 25	330,540	448,700	450,900	31288	330,540,000	65225	411°	66,739,684
February..	51	12 $\frac{3}{4}$	108 4	5	526 35	250,274	404 050	408,050	27328	290,274,000	5481	408°	65,034,309
March .....	51	12 $\frac{3}{4}$	107	5	602 47	334,140	424,700	451,300	29759	334,140,000	40815	409°	68,686,923
April .....	51	12 $\frac{3}{4}$	116	4 $\frac{1}{2}$	717 10	306,017	562,800	565,000	35575	395,017,000	83377	422°	68,156,015
May .....	54	12 $\frac{3}{4}$	116 6	4 $\frac{1}{2}$	696 15	287,448	578,998	582,298	49277	387,448,000	84511	444°	65,106,189
June .....	53	12 $\frac{1}{2}$	111 6	4 $\frac{1}{2}$	684 45	411,476	538,606	542,606	37755	411,476,000	77649	440°	70,603,472
July .....	52	12 $\frac{1}{2}$	106 3	4 $\frac{1}{2}$	641	392,905	631,683	584,183	40804	392,905,000	76052	422°	65,676,731
August....	52	12 $\frac{1}{2}$	104 3	4 $\frac{1}{2}$	647 40	393,346	681,199	682,699	100576	393,346,000	78158	322°	60,298,009
September	52	12 $\frac{1}{2}$	100 2	5 $\frac{1}{2}$	609 30	359,491	618,319	621,919	90198	359,491,000	78096	578°	48,046,583
October ..	52 $\frac{1}{2}$	12 $\frac{1}{2}$	102 6	5 $\frac{1}{2}$	548	322,643	573,455	577,875	116151	322,643,000	73871	564°	48,100,756
November.	50	12 $\frac{1}{2}$	93 4	5	403 46	258,458	443,201	443,201	65631	258,458,000	58641	345°	45,480,327
December	53	12 $\frac{1}{2}$	100	5	605 25	330,335	647,640	651,440	90527	330,333,000	82352	511°	42,634,941
Totals .....	52	12 $\frac{3}{4}$	106 $\frac{3}{4}$	4 $\frac{3}{4}$	7,550 12	4,207,021	6,462,761	6,511,471	714894	4,207,021,000	872534	472°	.....

Erle Pump. Coal used until August, when contract for furnishing necessary fuel per million gallons pumped went into operation. The kind of fuel used was inferior in quality but cost less to the city per million gallons pumped under contract system than the better kinds under the usual system

# ENGINE NO. 26.

Date.	Steam press.	Vacuum.	Height of water in feet	Receiver.	No. of hours run.	Total revolutions.	Coal burned for pumping out dry well. IN TONS	Total amt. of coal burned for all purposes.	Ashes.	U. S. gal. delivered into city allowing 3 1/2 p. c. for loss of action, etc.	Cubic feet of water fed into boilers.	Temperature of flues.	Duty for 100 lbs. of coal burned.
1878					H. M.								
January .....	52	12 3/4	108 25	5	614 15	332,812	447,000	449,200	30037	332,812,000	63852 411°	411°	57,238,579
February ..	51	12 3/4	109 ..	5	536 45	296,976	401,150	407,100	26112	296,976,000	53776 408°	408°	57,092,872
March ..	51	12 1/4	107 5	5	588 30	326,974	420,700	428,900	28844	326,974,000	92117 409°	409°	69,572,658
April .....	51	12 3/4	115 6	4 1/2	720 ..	397,886	563,800	566,000	36795	397,886,000	82456 422°	422°	78,120,339
May .....	54	12 3/4	116 ..	4 1/2	705 30	394,950	591,802	595,102	51017	394,950,000	89335 414°	414°	64,494,224
June .....	53	12 1/2	111 2	4 1/2	663 10	388,737	524,654	526,454	35183	388,737,000	74550 410°	410°	68,804,519
July .....	52	12 1/2	106 4	4 1/2	639 ..	396,755	541,417	541,417	45012	396,755,000	92225 422°	422°	65,162,377
August ..	52	12 1/2	104 3	4 1/2	640 30	391,305	674,001	685,493	101719	391,305,000	78212 522°	522°	59,562,287
September..	52	12 1/2	100 43	5 1/2	617 ..	361,746	617,786	624,280	96388	361,745,000	75512 578°	578°	48,947,973
October .....	52	12 1/2	101 ..	5 1/2	630 30	364,724	639,925	642,327	94467	364,724,000	81306 564°	564°	46,505,702
November..	50	12 1/2	89 ..	5	392 45	221,710	397,499	397,499	57137	227,710,000	47593 545°	545°	42,560,043
December..	53	12 1/2	100 2	5	611 30	334,384	660,590	665,480	91386	334,384,000	82336 511°	511°	42,360,190
Total .....	52	12 3/4	105 3/4	4 3/4	7,359 10	4,211,897	6,480,314	6,525,264	659337	4,211,897,000	886319 473°	473°	.....

Erle Lump Coal used until August, when contract for furnishing necessary fuel per million gallons pumped went into operation. The kind of fuel used was inferior in quality but cost less to the city per million gallons pumped under contract system than the better kinds under the usual system.

### COMBINED OPERATIONS OF NORTH AND WEST WORKS.

The reported operations of both pumping works show a total number of gallons pumped during the year 1878 of 19,564,288,232, or an estimated daily average of 52,600,789 gallons; and a total cost of pumping all the water delivered during the year 1878 of \$116,043 66, or an average of \$5.93 $\frac{1}{10}$  per million gallons.

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### TELEPHONE.

The connecting of the pumping stations and the crib with the City Hall was a most interesting and remarkable event. It was pressed upon the department by Col. J. J. S. Wilson, Superintendent of the Western Union Telegraph Co. It has already been of great value and convenience, and promises to be still more useful in the future when connected with the general lines.

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### CONSUMPTION AND WASTE OF WATER.

To show the progress of water consumption and demand in various bearings, the following statement has been corrected from previous reports, and brought up to the end of 1878. The average daily quantity for all years previous to 1877 means pump measurement, without any allowance for leakage of valves or pumps. For 1877 and 1878 a deduction of about 6 per cent. on this account was made. A great many trials prove that this loss is very variable here, and experience elsewhere shows that we are not alone in this respect.

## TABULAR STATEMENT OF THE CONSUMPTION AND WASTE OF WATER.

[illegible]

Among the important facts contained in the foregoing statement is the average consumption of water by each inhabitant which, it will be seen, is slightly greater than that of last year. As compared with the consumption of other cities, it is thought that the accompanying diagram, originally prepared in the office of Mr. Joseph P. Davis, City Engineer of Boston, will present this subject in a more striking light than a tabular statement.

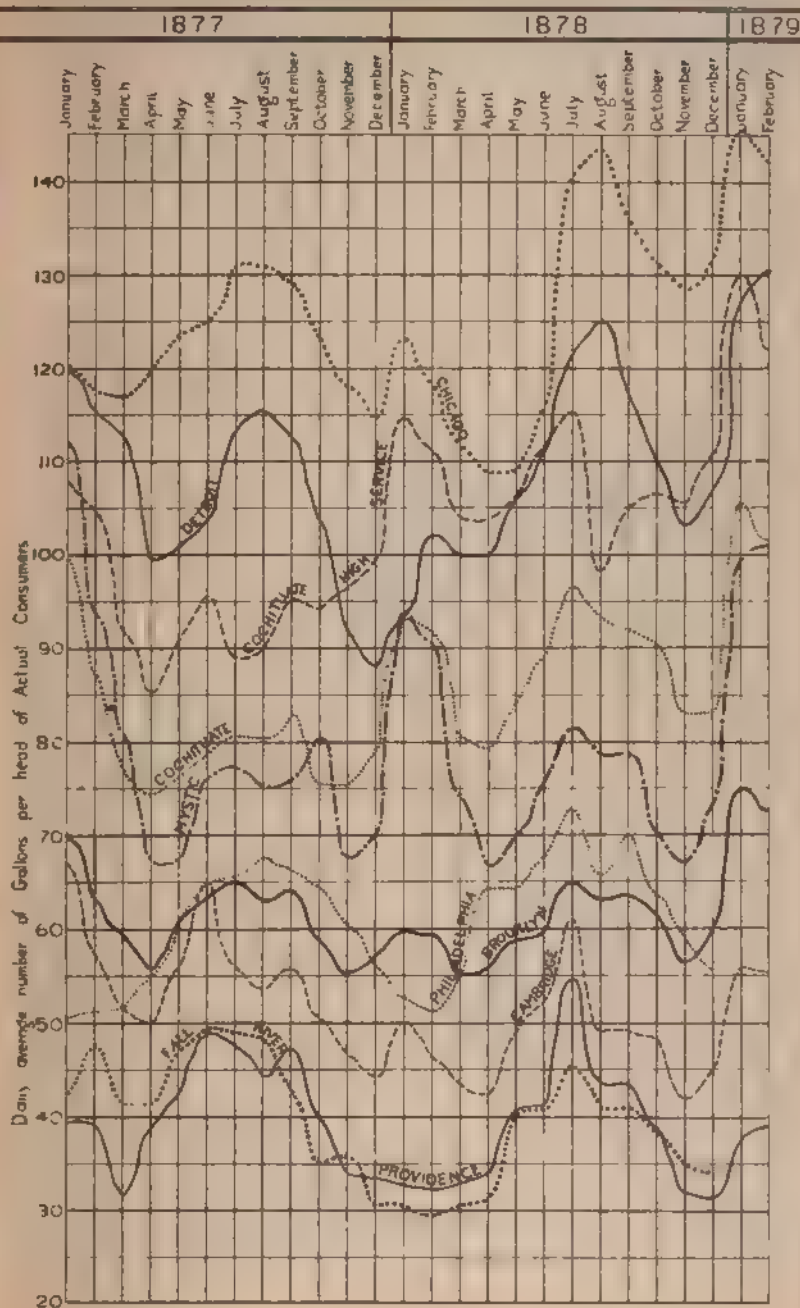
That for all legitimate purposes whatever, in a city like ours, it should require a hogshead and a quarter of water for each man, woman and child is not possible, and is simply evidence of enormous waste. How to prevent it has become, in this as well as other cities, a great and perplexing problem. Everywhere the conviction is gaining strength that nothing but meters can do this within available means. So far as used here, they bring a revenue twice as great in proportion as the frontage and other rates for the balance of the water furnished to the city. Yet they are not popular, and various objections are made to them, none well grounded however against their accuracy or the strict justice of charging according to their registers. Their immediate and universal adoption would cause a serious decline in the total water revenue; but a very few years however would restore the revenue and be accompanied by other and lasting benefits.

#### NECESSITY FOR NEW PUMPING MACHINERY.

To show the pressing demand for a diminution in the waste of water, and the absolute necessity there is for immediate steps towards procuring new pumping machinery, the accompanying diagram of average and extreme daily consumption each month during the past twelve years is presented. On it is also shown the entire pumping capacity of the city, together with what may be considered the available capacity at all times, that is supposing the largest engine to be at rest, as every engine must occasionally, and ought twice in a year, to be stopped for examination and, if necessary, repairs. On the diagram is a line showing the increasing average demand for water during the past six

# —DIAGRAM—

SHOWING THE DAILY AVERAGE CONSUMPTION OF WATER PER HEAD OF CONSUMERS FROM THE CHICAGO, DETROIT, COCHITATE HIGH SERVICE, COCHITATE, MYSTIC PHILADELPHIA BROOKLYN, CAMBRIDGE, FALL RIVER AND PROVIDENCE WATER WORKS.

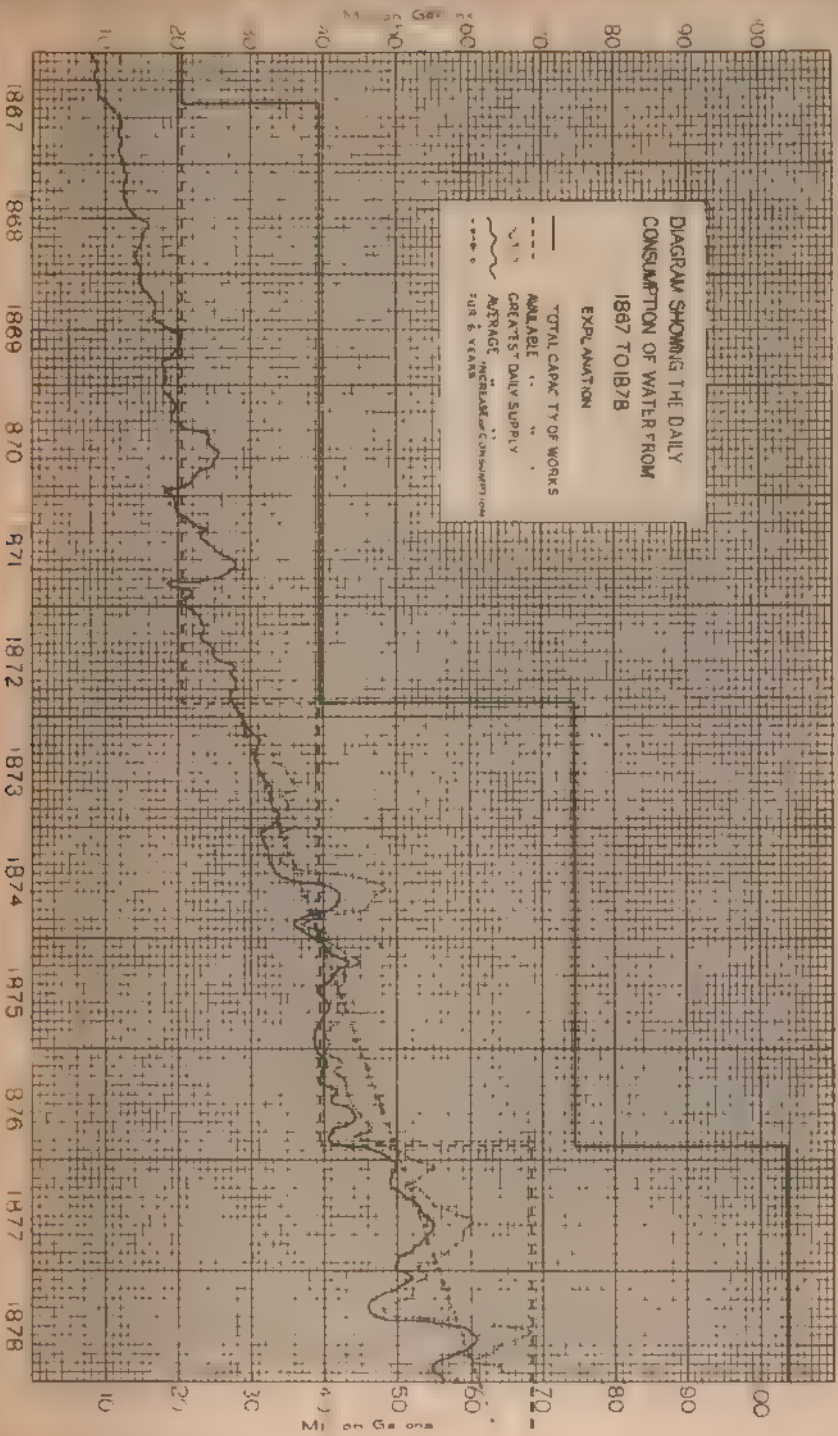


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# DIAGRAM SHOWING THE DAILY CONSUMPTION OF WATER FROM 1867 TO 1878

- EXPLANATION
- TOTAL CAPACITY OF WORKS
  - - - AVAILABLE
  - ~ ~ ~ CURRENT DAILY SUPPLY
  - ~~~~~ AVERAGE INCREASE OF CONSUMPTION FOR 5 YEARS



APRIL 1880

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TILDEN FOUNDATIONS.**

years. This line, it will be perceived, cuts the line of present available and reliable pumping capacity in 1880, or before it will be possible to have new pumping engines of proper size erected. Of course, it is not certain that the average daily consumption by the whole city will continue to increase as it has done; but the era of renewed prosperity, which we hope has begun to dawn upon the country, is not likely to be accompanied by a diminished demand for water. Without then either a very prompt stoppage of waste, or increased pumping capacity, great inconvenience, and in some sections of the city, suffering must be felt. The prospect of stopping waste to any great extent is so slight that the erection of two new pumping engines is earnestly recommended. These, it is believed, should be of not less than fifteen million gallons capacity each, and placed at the West Side station in an extension southerly of the present building. They could scarcely be completed before it will be necessary to renew the two oldest engines at the North Side station, which occupy too valuable space for machinery of such limited capacity as well as age. This could not possibly be done without great danger to the interests of the city before the completion of those at the West Side station.

### QUALITY OF THE WATER.

Nothing special with regard to this was noticed by the Department during the year.

Mr. B. W. Thomas, an amateur microscopist, has paid much attention for several years past to the organisms found in the lake water, as supplied to the city, and has kindly furnished a paper embodying the results of his observations. That paper is herewith submitted, with the recommendation that it be published with this report. Although Mr. Thomas' conclusion may not be universally accepted, the statements he makes cannot fail to interest all who take time to examine this subject.

### INLET BASINS.

The old one, though no longer available as a means of supply, affords protection to the new inlet which is ready for use

in case of necessity. From the 8th to the 12th of January of this year the new inlet proved to be of great value, as a sufficient supply could not be obtained from the Crib, owing to the accumulation there of anchor ice. It is thought best to keep men cleaning away sand and other obstructions from the entrance to this inlet.

### RESERVOIRS.

These still stand, but are of no use.

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### DISTRIBUTING PIPES.

The actual increase in the total length of pipes laid in the city was less last year than during any other year since 1861. This was owing mainly to the great depression in financial matters and the consequently limited number of buildings erected. The work of replacing small pipes with larger ones, as will be seen below, was continued to a moderate extent, but should be carried still further. It is very gratifying to know that most of the valuable business portion, as well as several other parts of the city is so liberally supplied with pipes of ample size for fire purposes; but there are still considerable districts of which this cannot be said. Attention was called to this subject in 1864 and 1866, as well as subsequently in the published annual reports. The fearful rapidity with which fires sometimes spread makes more apparent than ever the necessity of continuing to replace the 4 inch pipes, of which so many were laid in former years, by those of a larger size. In the laying of new pipes the importance of having larger mains has been kept constantly in mind; hence the apparent inconsistency that will be found in the plans of the distributing system, large mains on some streets connecting only with small ones; but as the department may be allowed to carry out future work the gaps in the lines of larger pipes should be filled up. This would greatly improve the efficiency of the pipe system for fire protection in several parts of the city.

The day is probably not far distant when the 36 inch pipe which now connects the North Pumping Works with the centre of the city will be extended to the West Side Works. The value of this, even in ordinary times, would be quite appreciable either in giving a better water pressure where it is most needed, or in the saving of fuel under the same pressure; but in case of extraordinary accidents to the largest engines it would be of very great advantage by preventing the pressure from falling so low in many parts of the city as it otherwise would.

There were laid during the year ending December 31st, 1878, the following main and distributing pipes, viz:—

## SOUTH DIVISION.

ON WHAT STREET.	BETWEEN WHAT STREETS.	Length Diam.	
		in feet.	in inches
Archer avenue.....	Ashland avenue and Pitney avenue.....	875	12
Archer avenue.....	In connection at Mary street ..	36	6
Bloom street .....	Thirty fifth street and southward.....	396	4
Franklin street .....	South Water street and southward.....	66	8
Franklin street .....	Across Randolph street.....	128	8
Harrison street.....	Fifth avenue and Franklin street .....	372	8
Hubbard court .....	In connection at Michigan avenue. . .	36	8
Iglehart avenue.....	From end of pipe so. of 27th st southward..	144	4
Kossuth street.....	Across Stewart avenue .....	66	4
Laballe street. . . . .	Madison and Monroe streets.....	347	8
Lowe avenue.....	Twenty sixth street and southward.....	1778	6
Michigan avenue.....	Harrison street and Hubbard court.....	450	8
Napoleon place.....	Wentworth avenue and westward.....	36	6
Paulina street.....	Archer avenue and Mulligan street .....	240	6
Randolph street.....	Laballe and Franklin streets.....	950	8
Swift place.....	Wentworth avenue and westward.....	36	6
Spring street. . . . .	Across Wentworth avenue.....	48	6
Twenty-fourth street..	South Park and Lake avenues .....	333	8
Twenty fifth street ...	Wentworth avenue and eastward.....	48	6
Twenty-seventh street..	Wentworth avenue and westward.....	36	6
Thirty-fourth street.....	Indiana and Michigan avenues.....	364	6
Thirty-seventh street ...	Halsted street and westward.....	36	6
Vernon avenue.....	Thirty-seventh street and northward.....	84	4
Wentworth avenue.....	Twenty second street and northward. . . .	347	12
Wentworth avenue.....	Twenty third and Bushnell streets ..	288	6
		8 024	
	Hydrants.....	825	
	Total South Division.....	8,849	

## THIRD ANNUAL REPORT OF

## WEST DIVISION.

ON WHAT STREET.	BETWEEN WHAT STREETS.	Length	Diam.
		in feet	in inches
Alley so. of Moore st.	Corwin place and eastward.....	389	4
Ashley street.....	Hoyne avenue and eastward.....	365	6
Artesian avenue.....	End of pipe so. of Ohio and southward.....	180	6
Brigham street.....	Wood and east to connect.....	312	6
Brown street.....	Twentieth street and north to connect.....	276	6
Chicago avenue.....	Hoyne avenue and Leavitt street.....	670	6
Chicago avenue.....	Robey and Lincoln streets.....	668	6
Corwin place.....	from alley north of Blue Island avenue.....	218	4
Division street.....	Milwaukee and Ashland avenues.....	184	8
Edgar street.....	Bloomington road and southward.....	405	6
Eighteenth street.....	Ashland avenue and east to connect.....	204	6
Elston avenue.....	Armitage road and northward.....	820	8
Ewing street.....	Halsted street and westward.....	247	8
Front street.....	Halsted street and westward.....	308	6
Harrison street.....	Wood and Paulina streets.....	672	8
Hermitage avenue.....	Harrison street and southward.....	200	6
Irving place.....	Adams street and southward.....	42	6
Johnson street.....	Canalport avenue and Twenty-second street.....	430	6
Lafin street.....	Polk and Spruce streets.....	280	6
Leavitt street.....	Across Chicago avenue.....	100	6
Lincoln street.....	Across Chicago avenue.....	100	6
Lincoln street.....	Blue Island avenue and northward.....	191	6
Loomis street.....	Blue Island avenue and southward.....	144	8
Lumber street.....	Halsted street and westward.....	401	6
Morgan street.....	Twenty-first and Clayton streets.....	228	8
Nixon street.....	Polk street and southward.....	337	6
Oakley avenue.....	Adams street and northward.....	36	6
Park avenue.....	In connection at Staunton street.....	25	8
Paulina street.....	Jackson and Adams streets.....	364	6
Polk street.....	Lafin and Nixon streets.....	532	8
Robey street.....	Evergreen and Fowler streets.....	384	8
Robey street.....	Chicago avenue and southward.....	58	6
Seeley avenue.....	Monroe and Madisons trees.....	384	6
Seventeenth street.....	Paulina street and westward.....	361	6
Spruce street.....	Across Lafin street.....	40	6
Staunton street.....	Madison street and Park avenue.....	978	8
VanBuren street.....	Across Hoyne avenue.....	73	8
VanBuren street.....	Hoyne and Lincoln streets.....	330	8
Wilcox avenue.....	California avenue and eastward.....	331	6
Warren avenue.....	Across Staunton street.....	90	8
Washington street.....	Across Staunton street.....	86	8
		12258	
	Hydrants.....	2076	
	Total, West Division.....	14333	

## NORTH DIVISION.

ON WHAT STREET.	BETWEEN WHAT STREETS.	Length in feet	Diam. in inches
Clay street.....	Halsted street and westward.....	68	8
Centre street . . . . .	Lincoln avenue and eastward.....	70	6
Elm street.....	Sedgwick and Franklin streets.....	580	8
Franklin street.....	Across Lincoln avenue.....	168	8
Fullerton avenue . . . . .	High street and eastward.....	165	8
Halsted street.....	Division street and southward.....	400	6
Halsted street . . . . .	North Branch and southward.....	240	6
Halsted street.....	Hooker street and northward.....	390	6
Hawthorn avenue . . . . .	Halsted street and south-eastward.....	50	8
Hooker street . . . . .	Halsted street and north-westward.....	90	6
Herndon street.....	Clybourn ave. and 300 feet n. of Sophia st.....	520	6
Kingsbury street.....	Across Michigan street.....	94	12
LaSalle street . . . . .	In north approach of river tunnel.....	75	6
Lincoln avenue . . . . .	Wells and Sophia streets.....	2332	6
Loneragan street.....	Lincoln avenue and southward.....	60	6
Lewis street.....	Sophia street and northward.....	321	6
Moore street.....	Division and Elm streets.....	308	6
Maple street . . . . .	Clark and LaSalle streets.....	450	6
Michigan street . . . . .	Market and Kingsbury streets.....	360	12
North branch street...	Division street and northward.....	365	6
Racine avenue . . . . .	Centre and Sophia streets.....	643	8
Sophia street . . . . .	Across Racine avenue.....	109	8
Sophia street.....	Herndon and Lewis streets.....	330	6
Weed street.....	Halsted street and westward.....	60	8
Weed street.....	60 ft. w of Halsted and westward.....	30	6
Wesson street . . . . .	Oak street and southward.....	24	4
Wisconsin street.....	Across Lincoln avenue.....	150	8
		8443	
	Hydrants .....	825	
	Total in North Division.....	8768	

The whole length of pipes laid in the city during the year was 31,950 feet— $6\frac{27}{8280}$  miles.



## PIPES TAKEN UP AND ABANDONED.

The following is a list of the pipes which during the year were taken up out of the ground and larger ones were laid in their stead :

LOCATION OF PIPES.	LENGTH IN FEET.	Diam- eter in inches
Franklin street across Lincoln avenue. ....	163	4
LaSalle St., bet. Monroe and Madison Sts..	337	4
Lincoln Av., bet. Wells and Sophia Sts....	2,332	4
Michigan Av., bet. Harrison and Hubbard Ct.	450	3
Wentworth Av., bet 23rd and Bushnell Sts.	288	4
Total.....	3,570	

The total length of pipe laid and in use at this date, as nearly as can be ascertained, is as follows, viz. :

	Linear Feet.
24 inch wrought iron syphon pipe at Twelfth street..	258
36 " cast " main " .....	24,511
30 " " " " " .....	18
28 " " " " " .....	160
24 " " " " " .....	67,953
16 " " " " " .....	57,136
12 " " " " " .....	116,174
10 " " " " " .....	8,012
8 " " " " " .....	410,070
6 " " " " " .....	873,269
4 " " " " " .....	691,368
3 " " " " " .....	21,240
	2,270,171

Or  $429\frac{5051}{5280}$  miles.



## HYDRANTS.

Much time and expense are necessarily devoted to the establishment and maintenance of hydrants. Without this the many millions that have been expended upon the water works would be of little value for fire purposes. Comparatively slight and often temporary considerations determine in the original construction of works the system to be adopted in relation to hydrants. When once adopted and carried out it is very difficult to make important changes except gradually and imperceptibly. At first in this city there were no open areas, no tall buildings, very few of brick, none of stone, no steam fire engines and no paved streets. In the winter a little manure packed around the tops of the hydrants was sufficient to protect them, their bottoms being in the ground instead of open areas. Now, in a large part of the city, manure besides being much more costly to procure than formerly has become an intolerable nuisance. Various expedients have been resorted to in order to dispense with the use of manure, the most effectual of them have been oil lamps, which, owing to the low price of kerosene, have been available to a very limited extent, but they cost far too much for general adoption. Packing with tan-bark was tried quite thoroughly, yet it not only cost too much but was generally so damp as to freeze. Sawdust, which can easily be obtained dry, has proved a much better material; at first, however, it was quite frequently a failure in consequence of moisture finding its way through the sidewalks and the area-walls. Recently, by the use of tar and felt paper, it is believed that one packing may be made to last several years, but the work requires great care and faithfulness on the part of those who do it. About 1,300 hydrants have now been packed around with sawdust.

As many new large double hydrants as the means of the department would allow have been established. In many cases small old hydrants have been removed from the central portions of the city to the outskirts, and their original places supplied with new ones of a larger size. With regard to the establishing of new and the replacement of old hydrants the views of the Fire department have been obtained and followed as far as practicable.

During the year ending Dec. 31, 1878, the following new hydrants were established, viz.:

## SOUTH DIVISION.

- One on Archer avenue, at Engine-House No. 8.
- One northeast corner Archer avenue and Ashland avenue.
- One north side Buoneparte place, east of Lock street.
- One northeast corner Clark street and Twenty-first street.
- One southwest corner Dearborn street and Twenty-fourth street.
- One northwest corner Fifth avenue and alley, between Monroe and Madison streets.
- One west side Franklin street, at Engine-House No. 1.
- One northeast corner Harrison street and Franklin street.
- One west side Iglehart place, at Seipp & Lehman's brewery.
- One on Johnson place, at north end of pipe.
- One northeast corner Kossuth street and Stewart avenue.
- One southeast corner LaSalle street and Randolph streets.
- One east side LaSalle street, between Randolph street and Washington street.
- One west side LaSalle street, between Madison and Washington street.
- One southwest corner Lowe avenue and Twenty-eighth street.
- One southwest corner Lowe avenue and Twenty-ninth street.
- One southwest corner Lowe avenue and Thirtieth street.
- One northeast corner Michigan avenue and Twenty-second street.
- One northwest corner Michigan avenue and Harrison street.
- One northwest corner Napoleon place and Wentworth avenue.
- One northeast corner Rannolph street and Wells street.
- One northeast corner Randolph and Franklin streets.
- One northeast corner Spring street and Wentworth avenue.
- One south side Twenty-second street, between Wabash avenue and Michigan avenue.
- One south side Twenty-second street, between Wabash avenue and State street.
- One south east corner Twenty-second street and State street.
- One south side Twenty-second street, between Indiana avenue and Michigan avenue.

- One southeast corner Twenty-second street and Indiana avenue.
- One northwest corner Twenty-fourth street and Lake avenue.
- One northeast corner Twenty-fifth street and Wentworth avenue.
- One northeast corner Twenty-seventh street and Wentworth avenue.
- One northwest corner Vernon avenue and Thirty-seventh street.
- One east side Wentworth avenue, between Twenty-second street and Twenty-third street.
- Total, South Division, 33.

## WEST DIVISION.

- One northwest corner Adams street and Campbell avenue.
- One south side Adams street, between Halsted and Desplaines streets.
- One southwest corner Adams street and Halsted street.
- One northeast corner Adams street and Irving place.
- One northwest corner Artesian avenue and Grand avenue.
- One northeast side Blue Island avenue, between Sixteenth street and Eighteenth street.
- One northwest corner Brown street and Wright street.
- One southwest corner Canal street and Polk street.
- One northwest corner Canal street and Forquer street.
- One northwest corner Canal street and the alley south of De-koven street.
- One southwest corner Canal street and Ewing street.
- One northwest corner Centre avenue and Arthington street.
- One west side Centre avenue, between Polk street and Taylor street.
- One northwest corner Clinton street and Judd street.
- One west side Corwin place, south of alley, north of Blue Island avenue.
- One northeast corner Desplaines street and Washington street.
- One northeast corner Desplaines street and Adams street.
- One west side Elston avenue, 800 feet north of Armitage road.
- One north side Ewing street, between Halsted street and Desplaines street.

One north side Front street, 300 feet west of Halsted street.  
 One northwest corner Fulton street and Albany avenue.  
 One northwest corner Gurley street and Blue Island avenue.  
 One west side Halsted street, opposite Bunker street.  
 One west side Halsted street, opposite Barber street.  
 One west side Halsted street, opposite O'Brien street.  
 One west side Halsted street, opposite Liberty street.  
 One northeast corner Halsted street and Meridian street.  
 One northwest corner Harrison street and Hermitage avenue.  
 One northwest corner Hermitage avenue and York street.  
 One northwest corner Hoyne avenue and Van Buren street.  
 One west side Hoyne avenue, opposite McGrath street.  
 One northwest corner Hoyne avenue and Chicago avenue.  
 One northwest corner Jackson street and Campbell avenue.  
 One northwest corner Jackson street and Hoyne avenue.  
 One northwest corner Jefferson street and Barber street.  
 One southwest corner Kedzie avenue and Fulton street.  
 One southwest corner Leavitt street and Chicago avenue.  
 One southwest corner Lincoln street and Chicago avenue.  
 One southwest corner Loomis street and Blue Island avenue.  
 One northwest corner Loomis street and Seventeenth street.  
 One northwest corner Lumber street and Maxwell street.  
 One north side Lumber street, west of Halsted street.  
 One northeast corner Lytle street and McAllister place.  
 One northwest corner Lytle street and Arthington street.  
 One northwest corner Madison street and Peoria street.  
 One northeast " " " " Sangamon street.  
 One northwest " " " " Clinton street.  
 One northwest " " " " Green street.  
 One northwest " " " " Curtis street.  
 One northwest " " " " May street.  
 One northwest " " " " Centre avenue.  
 One northeast " " " " Elizabeth street.  
 One northeast " " " " Desplaines street.  
 One northwest " " " " Halsted street.  
 One northwest " " " " Ada street.  
 One northeast " " " " Sheldon street.  
 One northwest " " " " Ogden avenue.  
 One northwest " " " " Ashland avenue.

- One northeast corner Madison street and Bishop court.  
 One northeast " " " " Throop street.  
 One west side May street, opposite Eleventh street.  
 One west side Miller street, between Polk street and Taylor street.  
 One northwest corner Miller street and Gurley street.  
 One west side Morgan street, between Polk street and Taylor street.  
 One northwest corner Morgan street and Twenty-first street.  
 One west side Nixon street, 300 feet south of Polk street.  
 One on School street at end of pipe west of Desplaines street  
 One north side Sixteenth street, opposite Allport avenue.  
 One north side Seventeenth street, east of Centre avenue.  
 One northwest corner Staunton street and Madison street.  
 One southwest " " " " Warren avenue.  
 One southwest " " " " Washington street.  
 One southwest " " " " Park avenue.  
 One northwest corner Stewart avenue and Barber street.  
 One northwest corner Taylor street and Loomis street.  
 One north side Taylor street, opposite Johnson street.  
 One northeast corner Van Buren street and Halsted street  
 One northeast corner Waldo street and Halsted street.  
 One northwest corner Warren avenue and Staunton street.  
 One north side Warren avenue at railroad crossing east of the  
 C. & N. W. R. R.  
 One southwest corner Washington street and Clinton street.  
 One northwest corner Wilson street and Clinton street

Total, West Division 82.

#### NORTH DIVISION.

- One northwest corner Elm street and Clark street.  
 One southwest corner Franklin street and Wisconsin street.  
 One west side Halsted street, 260 feet north of Willow street.  
 One west " " " 226 feet south of Clay street.  
 One east " " " 368 feet south of Centre street.  
 One west side Halsted street, between Sophia street and Centre street.

One southeast corner Halsted street and Hawthorn avenue.  
One northwest corner Herndon street and Sophia street.  
One northeast corner LaSalle street and North Water street.  
One northwest corner Lincoln avenue and Wells street.  
One northwest corner Lincoln avenue and Centre street.  
One southeast corner Michigan street and Kingsbury street.  
One southwest corner Racine avenue and Sophia street.

Total, North Division, 13.

In all 128, making, together with those previously in, 3,130 hydrants in the city at this date, of which number 1,075 are of the double nozzle pattern. During the year 147 hydrants were renewed, and 188 received more or less repairs. The record for January of this year shows scarcely any trouble with hydrants on account of frost; but in December 298 were found frozen and had to be thawed out.

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### STOPCOCKS.

The following stopcocks were put in during the year, viz.:

#### SOUTH DIVISION.

One 12 inch, Archer avenue, west line Ashland avenue.  
One 6 inch, Archer avenue, west line Ashland avenue.  
Two 12 inch, Archer avenue, at east and west shafts of W. P. Tunnel.  
One 6 inch, Ashland avenue, south line Archer avenue.  
One 8 inch, Clark street, south line Madison street.  
One 6 inch, Clark street, in blow-off at Madison street.  
One 8 inch, Dearborn street, south line Madison street.  
One 4 inch, Dearborn street, south line Madison street.  
One 8 inch, Fifth avenue, south line Madison street.  
One 6 inch, Fifth avenue, north line Randolph street.



- Two 8 inch, Franklin street, north and south line Randolph street
- One 4 inch, Harrison street, in blow-off at Fifth avenue.
- One 4 inch, Kossuth street, west line Stewart avenue.
- One 6 inch, LaSalle street, south line Madison street.
- One 4 inch, LaSalle street, in blow-off at Madison street.
- One 8 inch, LaSalle street, south line of Madison street.
- Two 8 inch, LaSalle street, north and south line of Randolph street.
- One 6 inch, Lowe avenue, south line of Twenty-ninth street.
- One 4 inch, Market street, south line of Madison street.
- One 8 inch, Market street, south line of Madison street.
- One 4 inch, Market street, in blow-off at Madison street.
- One 4 inch, McGregor street, west line Stewart avenue.
- One 8 inch, Michigan avenue, south line Harrison street.
- One 6 inch, Paulina street, south line Archer avenue.
- One 8 inch, Randolph street, west line LaSalle street.
- Two 8 inch, Randolph street, east and west line Fifth avenue.
- One 8 inch, Randolph street, west line Franklin street.
- One 6 inch, Spring street, east line Wentworth avenue.
- One 8 inch, State street, south line Madison street.
- One 6 inch, State street, south line Madison street.
- One 6 inch, State street, in blow-off at Madison street.
- One 12 inch, State street, at intersection of Madison street.
- One 6 inch, Thirty-seventh street, west line of Halsted street.
- One 6 inch, Twenty-fifth street, east line Wentworth avenue.
- One 6 inch, Twenty-second street, in feeder at Wentworth avenue.
- One 4 inch, Vernon avenue, north line Thirty-seventh street.
- One 6 inch, Wentworth avenue, south line Twenty-ninth street.
- One 6 inch, Wentworth avenue, south line Twenty-second street.

Total, South Division, 42.

## WEST DIVISION.

- One 8 inch, Ada street, north line of Madison street.
- One 6 inch, Adams street, west line of Desplaines street.
- One 4 inch, Artesian avenue, south line of Fulton street.
- One 4 inch, Bishop court, north line of Madison street.
- One 6 inch, Canal street, in blow-off at Eighteenth street.
- One 6 inch, Carpenter street, north line of Madison street.
- One 6 inch, Chicago avenue, west line of Leavitt street.
- One 6 inch, Chicago avenue, west line of Lincoln street.
- One 4 inch, Curtis street, north line of Madison street.
- One 6 inch, Crawford avenue, south line of Lake street.
- One 12 inch, Desplaines street, north line of Adams street.
- One 6 inch, Desplaines street, in blow off at Washington street.
- One 8 inch, Elston avenue, north line Armitage road.
- One 8 inch, Elston avenue, 600 feet northwest from Canal place.
- One 4 inch, Elizabeth street, north line of Madison street.
- One 4 inch, Fulton street, west line of Oakley street.
- One 6 inch, Halsted street, south line of Randolph street.
- One 6 inch, Hermitage avenue, south line of Harrison street.
- One 6 inch, Irving place, south line of Adams street.
- One 4 inch, Irving place, north line of Fulton street.
- One 4 inch, Lake street, west line of Oakley street.
- Two 6 inch, Leavitt street, north and south lines of Chicago avenue.
- Two 6 inch, Lincoln street, north and south lines of Chicago avenue.
- One 6 inch, Lumber street, west line of Halsted street.
- One 6 inch, Madison street, in blow-off at Jefferson street.
- One 8 inch, Madison street, west line of Peoria street.
- One 8 inch, Madison street, west line of Clinton street.
- One 8 inch, Madison street, west line of May street.
- One 6 inch, May street, north line of Madison street.
- One 4 inch, Meridian street, east line of Halsted street.
- One 6 inch, Monroe street, in blow-off at Halsted street.
- One 16 inch, Monroe street, west line of Halsted street.
- One 6 inch, Nixon street, south line of Polk street.
- One 6 inch, Oakley street, north line of Fulton street.



One 6 inch, Ogden avenue, north line of Madison street.  
One 4 inch, Park avenue, west line of Oakley street.  
One 6 inch, Robey street, south line of Chicago avenue.  
One 6 inch, Seymour street, south line of Fulton street.  
One 6 inch, Sheldon street, north line of Madison street.  
One 8 inch, Staunton street, north line of Madison street.  
One 8 inch, Staunton street, south line of Washington street.  
One 8 inch, Staunton street, north line of Park avenue.  
One 6 inch, Waldo street, east line of Halsted street.  
One 4 inch, Walnut street, west line of Oakley street.  
One 4 inch, Warren avenue, west line of Oakley street.  
One 8 inch, Warren avenue, west line of Staunton street.  
One 8 inch, Washington street, west line of Staunton street.  
One 4 inch, Washington street, west line of Oakley street.  
One 8 inch, Western avenue, north line of Fulton street.  
One 8 inch, Western avenue, north line of Lake street.  
One 6 inch, Western avenue, north line of Madison street.

Total, West Division, 53.

#### NORTH DIVISION.

One 4 inch, Belden avenue, west line of Hurlbut street.  
One 4 inch, Burling street, south line of Webster avenue.  
One 4 inch, Burling street, south line of Willow street.  
One 4 inch, Bissel street, south line of Willow street.  
One 8 inch, Clay street, west line of Halsted street.  
One 8 inch, Clay street, in feeder at Halsted street.  
One 4 inch, Concord place, south line of Clybourn avenue.  
One 6 inch, Dayton street, south line of North avenue.  
One 4 inch, Dayton street, south line of Willow street.  
One 4 inch, Edward street, south line of Webster avenue.  
One 8 inch, Elm street, west line of Market street.  
One 4 inch, Elm street, west line of Clark street.  
One 8 inch, Franklin street, north line of Lincoln avenue.  
One 6 inch, Fremont street, south line of Willow street.  
One 4 inch, Grant place, west line of Hurlbut street.  
One 16 inch, Halsted street, south line of Clybourn avenue.  
One 6 inch, Herndon street, north line of Clybourn avenue.

## WEST DIVISION.

- One 8 inch, Ada street, north line of Madison street.
- One 6 inch, Adams street, west line of Desplaines street.
- One 4 inch, Artesian avenue, south line of Fulton street.
- One 4 inch, Bishop court, north line of Madison street.
- One 6 inch, Canal street, in blow-off at Eighteenth street.
- One 6 inch, Carpenter street, north line of Madison street.
- One 6 inch, Chicago avenue, west line of Leavitt street.
- One 6 inch, Chicago avenue, west line of Lincoln street.
- One 4 inch, Curtis street, north line of Madison street.
- One 6 inch, Crawford avenue, south line of Lake street.
- One 12 inch, Desplaines street, north line of Adams street.
- One 6 inch, Desplaines street, in blow off at Washington street.
- One 8 inch, Elston avenue, north line Armitage road.
- One 8 inch, Elston avenue, 600 feet northwest from Canal place.
- One 4 inch, Elizabeth street, north line of Madison street.
- One 4 inch, Fulton street, west line of Oakley street.
- One 6 inch, Halsted street, south line of Randolph street.
- One 6 inch, Hermitage avenue, south line of Harrison street.
- One 6 inch, Irving place, south line of Adams street.
- One 4 inch, Irving place, north line of Fulton street.
- One 4 inch, Lake street, west line of Oakley street.
- Two 6 inch, Leavitt street, north and south lines of Chicago avenue.
- Two 6 inch, Lincoln street, north and south lines of Chicago avenue.
- One 6 inch, Lumber street, west line of Halsted street.
- One 6 inch, Madison street, in blow-off at Jefferson street.
- One 8 inch, Madison street, west line of Peoria street.
- One 8 inch, Madison street, west line of Clinton street.
- One 8 inch, Madison street, west line of May street.
- One 6 inch, May street, north line of Madison street.
- One 4 inch, Meridian street, east line of Halsted street.
- One 6 inch, Monroe street, in blow-off at Halsted street.
- One 16 inch, Monroe street, west line of Halsted street.
- One 6 inch, Nixon street, south line of Polk street.
- One 6 inch, Oakley street, north line of Fulton street.

One 6 inch, Ogden avenue, north line of Madison street.  
One 4 inch, Park avenue, west line of Oakley street.  
One 6 inch, Robey street, south line of Chicago avenue.  
One 6 inch, Seymour street, south line of Fulton street.  
One 6 inch, Sheldon street, north line of Madison street.  
One 8 inch, Staunton street, north line of Madison street.  
One 8 inch, Staunton street, south line of Washington street.  
One 8 inch, Staunton street, north line of Park avenue.  
One 6 inch, Waldo street, east line of Halsted street.  
One 4 inch, Walnut street, west line of Oakley street.  
One 4 inch, Warren avenue, west line of Oakley street.  
One 8 inch, Warren avenue, west line of Staunton street.  
One 8 inch, Washington street, west line of Staunton street.  
One 4 inch, Washington street, west line of Oakley street.  
One 8 inch, Western avenue, north line of Fulton street.  
One 8 inch, Western avenue, north line of Lake street.  
One 6 inch, Western avenue, north line of Madison street.

Total, West Division, 53.

#### NORTH DIVISION.

One 4 inch, Belden avenue, west line of Hurlbut street.  
One 4 inch, Burling street, south line of Webster avenue.  
One 4 inch, Burling street, south line of Willow street.  
One 4 inch, Bissel street, south line of Willow street.  
One 8 inch, Clay street, west line of Halsted street.  
One 8 inch, Clay street, in feeder at Halsted street.  
One 4 inch, Concord place, south line of Clybourn avenue.  
One 6 inch, Dayton street, south line of North avenue.  
One 4 inch, Dayton street, south line of Willow street.  
One 4 inch, Edward street, south line of Webster avenue.  
One 8 inch, Elm street, west line of Market street.  
One 4 inch, Elm street, west line of Clark street.  
One 8 inch, Franklin street, north line of Lincoln avenue.  
One 6 inch, Fremont street, south line of Willow street.  
One 4 inch, Grant place, west line of Hurlbut street.  
One 16 inch, Halsted street, south line of Clybourn avenue.  
One 6 inch, Herndon street, north line of Clybourn avenue.

One 6 inch, Hooker street, west line of Halsted street.  
One 6 inch, LaSalle street, south line of Division street.  
One 6 inch, LaSalle street, north line of North Water street.  
One 6 inch, Lincoln avenue, west line of Franklin street.  
Two 6 inch, Lincoln avenue, north and south lines of Centre avenue.  
One 6 inch, Lincoln avenue, south of Sophia street.  
Two 6 inch, Maple street, east and west lines of Clark street.  
One 4 inch, Maple street, in blow-off at Clark street.  
One 8 inch, North avenue, west line of Dayton street.  
One 4 inch, North avenue, in blow-off at Dayton street.  
One 6 inch, North Branch street, north line of Division street.  
One 6 inch, North Branch street, west line of Halsted street.  
One 6 inch, Orchard street, south line of Webster avenue.  
One 6 inch, Orchard street, south line of Willow street.  
One 8 inch, Sheffield avenue, south line of Clybourn avenue.  
One 8 inch, Sophia street, west line of Racine avenue.  
One 6 inch, Sophia street, west line of Lincoln avenue.  
One 6 inch, Vine street, south line of Willow street.  
One 8 inch, Weed street, west line of Halsted street.  
One 6 inch, Willow street, east line of Sheffield avenue.  
One 8 inch, Wisconsin street, west line of Lincoln avenue.

Total, North Division, 40.

In all, 135, which, together with those previously in, would give 2,836 Stopcocks of all sizes in the city at this date. During the year 9 were repaired and one was renewed.

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### LAKE TUNNELS.

Nothing occurred during the year to indicate that these were not in as good condition as previously reported. Repeated efforts were made to measure the water flowing through them under different heads, by means of a weir and the pumping engines, but without satisfactory results. It seemed impossible to avoid all sources of error.

## CRIB.

The repairs of this structure, mentioned in the last annual report, were completed early in the season. In all twenty-two steel rods, each three inches in diameter and twenty-eight feet long, were put through the sides of the Crib, that is, from the well to the outside. They are believed to be sufficient to prevent further bulging. An examination by divers in the summer did not reveal any movement of this kind whatever. Still there are new small cracks in different parts of the structure, which may be caused by shrinkage of the timbers below, or a settle-  
at the corners.

The recommendation in the last annual report to spend about \$3,000 in placing rip-rap around the Crib to the height of about twelve feet above the bottom of the lake has not been acted upon because of the statement of the keeper that on the south side, where there is already clay filling to the height of twelve feet or more, the force of the waves produces greater shocks than on any other portion of the Crib. Besides this, the alarming, but fortunately not very serious damage last year to the Cleveland Crib, a very similar structure to that of Chicago, is supposed to be owing partly, if not mainly, to the rip-rap filling around it; but the rip-rap at Cleveland comes much nearer the surface of the lake than has been proposed for the Chicago Crib.

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ADDITIONAL FIRE PROTECTION.

The possibility of the supply of water being cut off at the crib by ice or other causes was foreseen from the commencement of the first lake tunnel and kept continually in mind, as different annual reports will show. The question has occurred, if, at such a time, by a possible combination of natural causes, the new inlet should be obstructed, what could be done in case a serious fire should occur? To meet this possible, though very

improbable, contingency several plans have been suggested. One to connect, by means of a tunnel, the dock at the east end of Michigan street with the Erie st. shaft of the new lake tunnel extension; another to sink a new shaft in the main river in the west end of the Clark street bridge protection and then connect with the tunnel; and another to connect the well of the West Side Pumping Works with the dock in the rear. For fire protection alone this last plan would be not only the least expensive, but in other respects the most advisable, as it would be constantly under the immediate control of the engineer on duty there and could easily be kept free from ice by the escape of condensed water. In the construction of the proposed addition to those works this inlet could be provided for at a very small cost.

## SEWERAGE.

CHICAGO, January 1, 1879.

MR. E. S. CHESBROUGH, *City Engineer* :

DEAR SIR—I herewith submit a report of the expenditures incurred, and work done, in the construction and maintenance of sewers, with a statement of the private drains connected therewith for the past year; together with a summary of the same for previous years. Also some observations in regard to the adoption of a plan of drainage to reach portions of the city not at present provided for, and concerning other matters appertaining to the sewerage system that are thought to be of special interest.

The greater part of the year's work, in the way of construction, and the letting of contracts for the same was done in accordance with plans prepared by Mr. W. H. Clarke previous to his death, which occurred on the 5th of August last.

## TOTAL LENGTH IN FEET OF SEWERS, DECEMBER 31, 1878.

Diameter in ft.	SOUTH DIV.		WEST DIV.		NORTH DIV.		TOTAL, THREE DIVISIONS.		
	Previous to Dec. 31, 1877.	Year ending Dec. 31, 1878.	Previous to Dec. 31, 1877.	Year ending Dec. 31, 1878.	Previous to Dec. 31, 1877.	Year ending Dec. 31, 1878.	Previous to Dec. 31, 1877.	Year ending Dec. 31, 1878.	Total to Dec. 31, 1878.
6 $\frac{1}{2}$ "	...	..	976	404	...	...	976	404	1,380
6"	2,408	..	4,237	...	3,805	...	10,540	...	10,540
5 $\frac{1}{2}$ "	..	..	3,934	1,526	...	...	3,934	1,526	5,460
5"	9,118	..	47,355	...	13,750	...	70,223	...	70,223
4 $\frac{1}{2}$ "	6,244	..	62,171	3,467	9,035	...	68,050	3,467	71,517
4"	8,082	686	67,837	1,731	11,802	...	82,811	2,397	85,208
3 $\frac{1}{2}$ "	2,238	60	20,504	681	3,735	..	26,477	741	27,218
3"	..	..	665	...	...	...	665	...	665
2 $\frac{1}{2}$ "	31,961	1,363	23,841	2,250	12,130	....	67,941	3,613	71,554
2"	68,381	2,059	13,760	2,039	28,115	...	110,255	4,098	114,353
1 $\frac{1}{2}$ "	6,359	..	...	...	...	...	6,359	...	6,359
1"	105,069	11,485	256,217	17,178	167,079	3,238	468,352	31,901	500,253
...	2,608	2,937	16,841	6,401	2,852	1,160	16,301	10,488	26,789
...	162,408	10,613	243,029	12,775	111,822	5,410	535,259	28,776	564,035
Totals.	404,866	20,783	500,066	48,456	312,917	9,798	1,468,149	88,031	1,556,180
	434,640 feet.		198,816 feet.		322,715 feet.			10,855 1 5 2 8 0 Miles	294 8 8 6 0 5 2 8 0 Miles
	27.93 per cent.		51.31 per cent.		20.74 per cent.				



## CATCH BASINS AND MAN-HOLES, DECEMBER 31, 1878.

DIVISIONS.	Built during the year ending Dec. 31, 1878.				Built per- vious to Dec. 31, 1877.	Total built to Dec. 31, 1878.
	South	West	North	Total		
Catch Basins. ..	138	297	57	492	8,479	8,971
Man-Holes. ..	224	312	87	623	9,763	10,386

SUMMARY OF EXPENSES ATTENDING THE CONSTRUCTION OF  
SEWERS SINCE THE BEGINNING OF THE SYSTEM IN 1855, AND  
FOR THE YEAR ENDING, DEC. 31, 1878.

CHARACTER OF WORK.	Length in feet	Total to December 31, 1878.			For the year ending De- cember 31, 1878.		
		Length in feet	Average Cost	Total Cost	Length in feet	Average Cost	Total Cost
Brick Sewers ..	6 1/2	1,380	\$5.75	\$7,934.10	404	\$5.96	\$2,405.47
do do ..	6	10,540	1.87	19,710.20	..	..	..
do do ..	6 1/2	5,400	6.28	33,912.00	1,529	4.14	6,311.27
do do ..	5	70,229	6.55	459,200.95	..	..	..
do do ..	4 1/2	71,511	6.54	467,841.48	3,407	3.59	12,247.53
do do ..	4	85,208	6.17	525,825.56	2,397	3.08	7,380.43
do do ..	3 1/2	27,218	5.24	142,444.14	741	2.35	1,741.59
do do ..	3 1/4	680	5.08	3,454.40	..	..	..
do do ..	3	71,564	4.44	317,924.16	2,041	2.43	5,060.86
do do ..	2 1/2	114,054	3.40	389,785.60	4,938	1.86	9,184.82
do do ..	2 1/4	6,359	2.36	15,007.24	..	..	..
do do ..	2	500,251	2.34	1,170,587.34	1,901	1.42	2,701.42
Verified Clay Pipe Sewers ..	1 1/4	26,789	1.62	43,408.18	10,488	1.14	11,956.32
do do do do ..	1	704,055	1.44	1,013,839.20	28,796	1.10	31,675.60
Catch-Basins ..	..	8,969	59.74	535,481.26	492	40.95	20,128.41
Twenty-second street outlet ..	..	..	..	..	..	..	1,111.94
Totals and averages ..	..	1,556,181	\$4.90	\$7,618,809.78	88,031	\$4.53	\$3,984,817.19
Manner in which sewers have been paid for.	Advances not re-paid Dec. 31, 1877 ..	..	\$44,444.75	..	..	..	..
	Advances made during the year ending Dec. 31, 1878 ..	..	6,144.02	..	..	6,144.02	..
	Less advances repaid during the year ..	..	5,049.52	..	..	5,049.52	..
	Leaving amount paid by ad- vances ..	..	45,539.25	..	..	1,104.50	..
	Amount paid by house drains ..	..	106,871.78	152,760.00	..	8,518.51	9,683.01
	Leaving for the amount paid by taxation ..	..	..	\$4,888,308.68	..	..	\$145,134.18
In addition to the above expenditure for construction, there has been expended the following amounts which are included in the total expenditures but not in the expendi- ture for the year ending Dec. 31, 1878, viz:							
For material now on hand ..		..	\$10,898.88	..	..	..	..
Less material on hand at beginning of year ..		..	1,432.84	\$4,490.04	..	..	..
For material used in sewerage maintenance and by water department, transfers of which have not been made ..		..	\$15,380.42	..	..	..	..
Less percentage reserved on uncompleted contracts for material ..		..	4,556.89	\$10,823.53	..	..	15,319.57
Making the total expenditure for the year as shown by the Ledger ..		..	..	..	..	..	\$460,453.75



There are now under contract to be built as soon as the weather will permit in the spring 31,156 lineal feet of sewers, the estimated cost of which is \$45,165.10.

DETAIL OF MAINTENANCE OF THE SEWERAGE SYSTEM FOR THE YEAR ENDING DECEMBER 31st, 1878:—

			Detail.		Totals.	
			No.	Cost.	No.	Cost.
CLEANING	Sewers feet cleaned by	Flushing . .	South division	170,365	\$3,019 40	...
			West "	214,265	1,595 00	
			North "	83,600	1,045 01	467,660 \$5,659 83
	Chain, Machine and Scrapers		South division	45,424	2,012 03	
			West "	114,465	4,015 19	
			North "	20,547	1,476 77	184,336 7,543 99
Catch Basins . . .		South division	1,902	3,011 65		
		West "	2,696	5,469 74		
		North "	1,963	3,119 12	6,561 12,500 55	
REPAIRS.	SEWERS.	2 ft. Waukegan ave S. of 16th st.	7	30 65		
		27 ft. So. Park av. N. of 26th	40	120 22		
		2 ft. Walnut av. So. of 24th	20	132 92		
		2 ft. Prairie ave. N. of 25th	9			
		1 1/2 ft. 30th st. cor. Dakota av.		4 12		
		2 ft. wing 25th st. & Vernon av.	36	125 55		
		2 ft. Clark st. bridge	11	176 26	123	609 72
	West D.	5 and 6 ft. Kinzie st. Jefferson to Desplaines	400	5,937 07		
		1 1/2 Laflin st. So. of 13th pl.	10			
		9 1/2 ft. Blue Island av. & Leavitt	7	30 20	417	3,967 27
	Catch basins and Manholes	South division . . .	29	360 40		
		West "	44	266 04		
		North "	70	486 50	143	842 94
	Manhole and Catch basin Covers.	South division . . .	838	1,751 27		
		West "	868	1,564 21		
		North "	414	916 71		
		where sts. were paved	402	2,070 00	2521	6,162 04
Street Intersections	Manholes to grade		671			
	Catch-basins to grade		464		1021	7,557 52
Total expenditure for maintenance						\$44,993 86

The large expense attending the repairs to the Kinzie street sewer was caused by the injury the sewer sustained in the construction of the approaches to the Milwaukee avenue viaduct.

**SUMMARY OF MAINTENANCE OF THE SEWERAGE SYSTEM SINCE  
THE ORGANIZATION OF THE BOARD OF PUBLIC WORKS IN  
1861, AND FOR THE YEAR ENDING DECEMBER 31st, 1878.**

		TOTALS AND AVERAGES.			
		For 18 years end- ing Dec. 31, 1878	For the year end- ing Dec. 31, 1878		
In use at the	Miles of sewers.....	2,534 <sup>6</sup> <sub>10</sub> *	278		
beginning	Number of manholes ..	90,106 *	9,753		
of the year.	Number of catch basins ..	72,527 *	8,479		
REPAIRS.	SEWERS	Total cost of repairs..	\$35,017.82	\$4,576.90	
		Annual average cost per mile based up in the total miles in use at the begin- ning of the year ..	13.82	16.43	
		Number of feet repaired ..	13,766	540.	
	Catch-basins and manholes	Total cost of repairs....	\$46,450.64	\$942.04	
		Annual average cost based upon the total number in use at the beginning of the year ..	0.28	0.05	
		Number repaired ..	4,918.	143.	
	COVERS	Total cost of repairs ..	\$62,919.43	\$6,182.04	
		Annual average cost based upon the total number in use at the beginning of the year ..	0.38	0.34	
		Number repaired and replaced ..	25,564	2,119.	
	CLEANING	SEWERS	Total cost of cleaning ..	\$255,588.95	\$13,203.82
			Annual average cost per mile based upon the total miles in use at the begin- ning of the year ..	100.82	47.51
			Number of miles cleaned ..	1,234.	90.
CATCH- BASINS.		Total cost of cleaning. ....	\$138,811.85	\$12,500.55	
		Annual average cost per basin based upon the number in use at the begin- ning of the year ..	1.91	1.47	
		Number of basins cleaned ..	58,641	6,161.	
Cost of raising man-holes and catch-basins to grade, where streets are to be filled and paved ..		\$105,954.48	\$7,557.62		
Total cost of maintenance ..		\$704,692.77	\$44,963.86		

\*These quantities are a sum of the number in use at the beginning of each of the eighteen years included in the table for the three items respectively.

SUMMARY OF RECEIPTS AND EXPENDITURES FOR PRIVATE DRAINS, WITH THE NUMBER OF PERMITS ISSUED FOR THE CONNECTION OF DRAINS OF VARIOUS SIZES SINCE THE BEGINNING OF THE SEWERAGE SYSTEM IN 1855, AND FOR THE YEAR ENDING DECEMBER 31st, 1878.

		PERMITS ISSUED.					Receipts.	Expendi- tures.
		15 inch.	12 inch.	9 inch.	6 inch.	Totals		
For the year ending Dec. 31st, 1878.	South division.	.....	2	44	360	406	.....	.....
	West division.	.....	1	47	743	791	.....	.....
	North division	.....	.....	16	331	347	.....	.....
	Totals .....	.....	3	107	1434	1544	\$9,029.63	\$16,477.41
Prior to 1878.....		3	196	1687	43142	45028	236,245.76	228,797.96
		3	199	1794	44576	46572	245,275.39	245,275.39
TOTAL TO DECEMBER 31st, 1878.		From the sale of permits the receipts have been.....					240,965 20	.....
		From appropriation the receipts have been....					4,310.19	.....
		For superintendence and inspection the expenditures have been.....					.....	138,423.61
		For junctions with the sewers the ex- penditures have been.....					.....	106,851.78

LIST OF SEWERS BUILT IN SOUTH DIVISION DURING THE YEAR 1878.

[illegible]

## 77

Different sizes . . . .  
All sizes 29 783 feet.

LIST OF SEWERS BUILT IN THE WEST DIVISION DURING THE YEAR 1878.

[illegible]



## WEST DIVISION—Continued.

LOCATION.		LENGTH IN FEET OF SEWERS BUILT										
ON WHAT STREET	FROM	TO	6½	5½	4½	4	3½	3	2½	2	1½	1
WING SEWERS												
Avon place . . . . .	M. H.	in Hoyle avenue	..	..	..	..	..	..	..	..	..	44
" and street . . . . .	M. H.	in Eighteenth street	..	..	..	..	..	..	..	40	..	44
" Congress street . . . . .	M. H.	in Hoyle avenue	..	..	..	..	..	..	..	..	..	44
" Irving place . . . . .	M. H.	in Adams street	..	..	..	..	..	..	..	..	..	41
" Jackson street . . . . .	M. H.	in Hoyle avenue	..	..	..	..	..	..	..	..	..	38
" Monroe street . . . . .	M. H.	in Hoyle avenue	..	..	..	..	..	..	..	..	..	44
" Pratt place . . . . .	M. H.	in Hoyle avenue	..	..	..	..	..	..	..	..	..	44
Total, West Division		Different sizes	404	1,526	3,363	1,731	681	2,250	2,001	17,174	6,401	12,773
		All sizes, 48,450 feet.										

LIST OF SEWERS BUILT IN NORTH DIVISION DURING THE YEAR 1878.

[illegible]



**NORTH DIVISION—Continued.**

THE DEPARTMENT OF PUBLIC WORKS.

81

[illegible]

### PROPOSED SEWERAGE SYSTEM FOR THE WEST DIVISION WEST OF CAMPBELL AVENUE.

Owing to the increase of population in the western portion of the city beyond the districts which can be drained through existing outlets, and the recognized necessity of drainage following close upon permanent improvements, the question of supplying sewers for the portion of the West Division west of Campbell avenue and south of Division street will soon have to be answered, at least so far as to determine upon a general plan to be carried out as the needs of the inhabitants and the finances of the city will permit.

The only practicable methods for securing drainage for the district in question seem to be either by building sewers—say one-quarter of a mile apart—on streets leading north from the West Fork of the South Branch of the Chicago River to Kinzie street or Chicago avenue, in accordance with the system pursued of late; or to obtain outlets into the North and South Branches of the river by a few large mains on streets running east and west upon which there are no existing mains, in a similar manner to the plan pursued for the drainage of the district east of Ashland avenue, as described in the report of 1855.

In order to secure a permanently inoffensive and innocuous disposition of the sewage, it is obviously desirable that it should be discharged into the North or South Branch, within the limits of the purifying action of the Fullerton avenue conduit, and the Illinois and Michigan Canal; rather than into the West Fork of the South Branch, to pollute the water and air by the decomposition which will inevitably occur, owing to the entirely stagnant condition of the water during a considerable portion of the year.

For the protection of the district in question against back-water from sewers, it is also desirable that the discharge should be into the main branches of the river, which are subject in but a small degree to fluctuations in the height of water. The West

Fork, on the other hand, owing to the limited section of its bed, is liable to great variations on account of the floods from the Desplaines River, which, at times, overflows its water shed, and comes in torrents through the Ogden and Wentworth ditch, and the West Fork into the Chicago River. So great have these floods been since the construction of the sewer on Western avenue that water has escaped into the street from the catch-basins at the corner of Western avenue and Harrison street. If the sewers should be constructed with outlets into the West Fork, and a flood in the Desplaines River should be coincident with a heavy local rain, immense damage might occur to property, not only on the line of the sewers discharging into the Fork; but, owing to the inter-lacing of the sewerage of the city, on the lines of those having their discharge into the South Branch as well. To be insured against the liability of the occurrence of these evils would undoubtedly justify considerable additional expenditure, should it be necessary.

An estimate of the total cost of draining the district included between Campbell avenue and the city limits, and Kinzie street and the West Fork based upon the two methods mentioned, viz.;

1st. By means of mains, one-quarter mile apart, with outlets into the West Fork, on streets leading north; and

2nd. By means of two large mains, one on Jackson street, with outlet into the South Branch, draining the sub-district between Kinzie and Twelfth streets, and the other one on Twenty-second and Laflin streets with outlet also into the South Branch, draining the sub-district between Twelfth and Twenty-sixth streets, or even farther south—the area south of this sub-district being drained into the West Fork shows a slight difference in cost in favor of the second plan.

The Twenty-second street main would need to be constructed in such a manner as to intercept all the ordinary sewage entering the West Fork from the district north of Twenty-second street, lying between Laflin street and Campbell avenue. The

present outlets into the Fork being used as storm water overflows, could be so furnished with gates as to keep back flood-water from the Desplaines.

The line of improvements west of Campbell avenue has hitherto been mostly confined to two areas, viz., between Campbell avenue and Central Park, and Harrison and Kinzie streets; and between Homan avenue and the city limits and Twenty-sixth street and Ogden avenue, in what is known as Lawndale; and it seems probable that it will so continue for some years to come. Hence any scheme for the complete drainage of the district west of Campbell avenue, should also have in view the drainage of the above named areas at the least possible outlay consistent with the perfection of the system as a whole.

An estimate of the outlay necessary to secure drainage of these two areas, by each of the two methods proposed, gives a difference of about two per cent. in favor of the first method, provided the main on Twenty-second street be only built from Leavitt street, using the outlets on Leavitt street and on Western avenue until such time as the extension of the system may render it necessary to build the permanent outlet on Twenty-second and Laflin streets.

The difference of the expense of the two methods, either in first or final cost, being insignificant, while the advantages in favor of draining into the main branches of the river decidedly preponderate, seems to render a decision in favor of the second plan imperative.

Whatever plan is adopted for the drainage of the unsewered portion of the West Side, south of Kinzie street, it appears, everything considered, that the most economical plan for the drainage of the district north of Kinzie street,—owing to the rock coming near to the surface in the vicinity of Western avenue, between Kinzie and Augusta streets, and to the fact that mains are already built on all the principal streets as far north as North avenue,—will be found by means of a large main leading to the northeast and discharging into the North Branch at Bloomingdale Road.

## MAN-HOLE AND CATCH-BASIN COVERS.

By reference to the table giving a summary of Sewerage Maintenance, it will be seen that for the last eighteen years the average annual cost of maintaining each wooden cover in use has been 38 cents, which is equal to the interest on \$5.40 at 7 per cent. per annum. That is, if by adding \$5.40 to the cost of wooden covers a permanent cover needing no repairs, or renewals, could have been obtained, it would have been equally economical.

The cost of new wooden covers for two or three years past has been slightly more than \$5 00. Six years ago it was about \$7.00. If permanent covers can be obtained at any price less than \$10.40 it will be economy to adopt them, to say nothing of the greater satisfaction and safety attending their use.

Covers of a good quality of cast iron can be had at a cost not exceeding \$8.00 each, which will be decidedly cheaper than wooden covers including first cost and maintenance. Even at the present low price of wooden covers, iron is the cheaper material, while it does not exceed  $2\frac{1}{2}$  cents per pound. Replacing wooden covers, with iron ones, as the former wear out or decay, and when streets are to be paved, will in a few years materially decrease the annual cost of repairs.

## SEWER VENTILATION.

Steps were taken early in the year to secure ventilation of the sewers through grated man-hole covers, and a small appropriation was made for that purpose by the City Council. As the taxes have not been collected, nothing has been done except to make preparations to begin putting them on as early in the spring as the weather will permit. The ventilation by means of grated covers can be more widely extended by the substitution of iron covers for wooden ones in repairs.

Owing to the yielding surface of the unpaved streets and the considerable amount of dirt which would undoubtedly be

worked through the openings in the iron covers, if open covers were applied to the man-holes in such streets, it may be advisable to find some means of ventilation through the catch-basins. This can be readily done by having a socket moulded on to the upper angle of the trap, toward the basin, and a second connection made with the basin by means of a curved piece of six-inch pipe, thereby furnishing an opportunity for the free circulation of air while still having the advantage of the trap in excluding silt from the sewer. The application of such a ventilating trap can be made to new catch-basins at a very small additional cost, and it will not be expensive in its application to old ones on unimproved streets. Should there be any nuisance created by this method of ventilation the openings can easily be stopped, and the basin sealed against the gases in the sewer as heretofore.

In some European cities, where ventilation is effected through the catch-basins, no difficulty has been experienced, and it seems hardly probable that there will be here, after ventilation has become general and thorough throughout the sewerage system.

The general application of street ventilation will unquestionably greatly reduce the amount of sewer gas which gains entrance to dwellings, and thereby prevent much of the actual evil which now results therefrom, and in a measure tend to allay the uneasiness felt by the public in regard to the subject. But after all shall have been accomplished by this method that is possible, there will still remain probably the most fruitful source of the evil complained of, in the foul emanations from the drains connecting the waste pipes of the houses with the street sewers.

To exclude the gases formed on the premises from the houses is equally as important as to exclude that generated in the main sewer. The latter may be done almost wholly by the system of ventilation proposed, the former only by a radical reform in the character of plumbing and drain-laying as practiced, and in the plans, or lack of plans, in arranging the traps, sinks, water-closets and other paraphernalia of the drainage system belonging to a house fitted with modern conveniences.



The present method of private drain supervision, while vastly better than none, really amounts to little more than keeping a record of where drains are laid; and to a partial enforcement of some general rules governing the manner of laying. In both its intent and accomplishment it is mainly a protection of the public sewers against the admission of substances which tend to deteriorate their quality, or obstruct the flow of sewage, rather than a guarantee to the property owner that the work in its planning and execution is such as to insure immunity from the escape of sewer gas. It is evidently a physical impossibility for four drain inspectors to personally inspect in one year the laying of from 1,500 to 2,000 drains spread over all parts of the city, and especially so as probably four-fifths of the number are laid during six months of the year. Even if it were possible to have an intelligent, faithful inspector on the ground during the whole time the draining and plumbing for each building was being done, unless the city exercised more control over private affairs than it has done heretofore, but little would be gained in the interest of health.

The custom is to allow the owner, or drain-layer, as it practically amounts to, almost free exercise of his discretion inside of the street lines, except so far as relates to the exclusion of certain substances from the sewers.

The more vital consideration—the exclusion of sewer gas from houses—in which is involved the character of the plan used and the faithfulness of its execution in material and workmanship—are left largely to hap-hazard and to a ruinous competition between drainlayers, each of which strives to dispense with every appendage which will add to the cost. The main effort being to use the cheapest material and labor which can be found in the market.

The idea that largely prevails that a licensed sewer builder is necessarily competent to plan a system of sewerage, with all its accompaniments of thorough trapping and safe ventilation, is sadly erroneous, and can not for the sake of the health and life of the city, be too soon removed. At the same time to

remove this delusion without providing a remedy is in the nature of a cruelty, in that it furnishes a knowledge of the existence of an evil without a protection against it. The difficulties of providing a remedy are the same that have always obtained, viz; the dislike of the majority of persons to be under restraint; the still vague conception in the public mind as to the nature of the evil to be corrected; and the question of increased expenses to the householder attending the enforcement of proper regulations, as well as the increased cost of the drains themselves, owing to the use of a greater quantity and a better quality of material and to the additional care that must be exercised in their use.

Much can and will be done, no doubt, by private interest among certain classes of the people, in the way of guarding against danger to health from sewer effluvia. Considerable advance has been made in this direction the past year or two; but after all is done that can be done in this manner, there will yet remain the more wide spread evil uncorrected. The large number of householders of moderate means, and the still greater multitude of people belonging to the tenant class, will be left unprotected. It is doubtless true that of the few scores of houses which have been provided with a really safe system of drainage scarcely one of them is occupied by a renter. Self-interest cannot be depended upon, under these circumstances, to shield the homes of a majority of the people against the deleterious effects of sewer-gas. It is to be feared that no system that can be devised will afford anything like a complete remedy. Benefits however can doubtless be largely extended by a wise and judicious exercise of power by the city; the first step of which would be to fix upon regulations in regard to the ventilation of house drains, the location of the soil and waste pipe connections therewith, and the proper arrangement of traps and catch-basins. The second step would be an official inspection of all proposed plans of drainage and a supervision during construction. This would require a large amount of careful, painstaking labor, that would have to be as far removed as possible from extraneous influences and considerations. It may not be practicable to inaugurate and carry such a system into force now, but that some such plan will ultimately be acknowledged essential seems more than probable.



## TWENTY-SECOND STREET OUTLET.

Some of the material has been purchased, and piles for a coffer-dam and scaffolding driven for the purpose of changing the sewer outlet at Twenty-second street and the lake, so as to relieve the vicinity of the nuisance created by the sewage collecting along the shore inside of the breakwater built by the Ill. Central R. R. Co.

Relief is intended to be afforded by means of an overflow chamber of stone masonry built around the present mouth of the sewer, from which a 30 inch cast iron pipe leads to the face of the outer breakwater. The pipe is expected to convey all the ordinary sewage, and the storm water, during the prevalence of the greater part of the storms, while the overflow chamber will furnish a means of escape for excessive storm water.

## TWELFTH STREET OUTLET.

At Twelfth street the outlet is perhaps in as bad a condition as the one at Twenty-second street; while the possibility of remedying it in a similar manner is forestalled by the prospect, that if such an improvement were carried out, it would soon have to be abandoned on account of filling between the shore and the outside breakwater. To build a permanent masonry outlet to the face of the outer breakwater will be quite expensive; but it will soon have to be done if no other plan of relieving the nuisance is determined upon.

Respectfully submitted,

BENEZETTE WILLIAMS,

*Principal Assistant Engineer*

### DEATH OF MR. CLARKE.

The date of Mr. Wm. H. Clarke's death has already been given by his successor, Mr. Williams. He was employed by the first Board of Sewerage Commissioners soon after their organization in 1855, and continued in that department during the rest of his life, the last sixteen years of which he had the entire charge of the sewerage. Two hundred and twenty-five miles of sewers, which cost about \$4,2500,000, was built under his directions. He planned the details, examining carefully the perplexing questions that sometimes arose concerning them, and arranged the contracts; he was singularly faithful, upright and conscientious, never swerving from what he believed to be right. The reports of the different Boards under which he served, as well as those of this department, bear testimony to his ability and faithfulness. Fortunate indeed is the community that secures and retains for so long a time the services of such a man.

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### CONDITION OF THE NORTH BRANCH.

The condition of the North Branch was very offensive a part of the year, and no doubt will be much of the time until the completion of the Fullerton avenue conduit.

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### FULLERTON AVENUE CONDUIT.

During the year plans and specifications for the necessary machinery and buildings were prepared, and proposals for constructing them received, but owing to the want of available funds no contracts were entered into, so that the whole work remains in about the same condition as that described in the last annual report. Some negotiations were commenced with reference to obtaining the necessary land for the engine-house and coal yard, but the city and the owner failed to agree though apparently very near it at one time.

Much has been said recently relative to pumping from the North Branch through the conduit into the Lake, and most strenuous objections have been made to it through fear that the water supply to the city as obtained from the Lake Tunnel Crib might be injuriously affected by it. It is very difficult to see how any stream that could be forced through the conduit should ever reach the Crib, a distance of two miles from the lake shore, and considerably farther from the end of the conduit. The effect of this discharge into the Lake could never be one-quarter, if one-tenth, as injurious at the Crib as that which frequently takes place now from the mouth of the river during the prevalence of strong southerly winds. When these winds are accompanied by freshets in the river, it is doubtful if the discharge from the conduit would in its injurious effects at the Crib be equal to the one hundredth part of that from the mouth of the river, and yet for this there is no present remedy, and none apparently within the power or means of the city in the early future. If the conduit can be allowed to operate as originally intended, not only will the condition of the North Branch cease to be offensive, but that of the Main River and the South Branch will be decidedly improved, while the latter result will be reversed if the conduit shall be made to discharge at all times in the North Branch. After heavy or continued rains it will be advisable either to discharge for a short time into the North Branch or to let the machinery remain idle, which will no doubt often be done.

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#### SOUTH FORK OF THE SOUTH BRANCH.

As the drainage of the Union Stock Yards flows into the South Fork of the South Branch and makes it very offensive, how to remedy this evil has been much discussed. The least costly plan would be to construct a small conduit which could also serve as an intercepting sewer between Halsted and Thirty-ninth streets and the mouth of this branch. Then by machinery a stream could be forced through the conduit and thus cause a

constant current up or down the branch as might be found best. Another and more effectual plan has been proposed which is to make a conduit between the end of the slip at Halsted and Thirty-ninth streets and the Lake. Borings have been made with reference to this as well as to the before mentioned project. The ground on the eastern portion of Thirty-ninth street was found to be decidedly unfavorable, but after considerable trial suitable ground was found along Thirty-ninth street as far as Portland avenue, and then on a line inclined considerably to the north, cutting the lake shore near Groveland Park. By means of a conduit, say nine feet in diameter, there the South Fork could be made to discharge either into the South Branch or into the Lake. If the latter, then the Main River and the South Branch would be greatly benefited as well as the South Fork, but the same troublesome question about the effect upon the Lake comes up again, as in the case of the Fullerton avenue conduit.

The whole subject of the disposal of the sewage of cities is a very serious one. Human beings, whatever their other qualities, are filth-making creatures. To get rid of this filth is troublesome and expensive. To turn it over to our neighbors, especially if they are much fewer in number than we, and have convenient receptacles, is very tempting

To send all of our sewage that now empties into the Main River and Branches down the Illinois and Michigan Canal into the Illinois River is very economical and convenient, but the deep and loud complaints heard from the cities and towns along the Illinois River show that even a continuance of the present system, in all its strength, much more a deliberate increase of it, will be resisted. If the lake shore is to be the receptacle of the city sewage, although the city's water supply from the Crib may not be contaminated, what is to become of the supplies to Hyde Park and Lake View. Hyde Park discharges her own sewage on the lake shore much nearer her pumping works than any of the sewage of Chicago is discharged, but the quantity discharged by Chicago is vastly greater than that of Hyde Park. An easy remedy for the difficulty, should the necessity be felt,

would be to make an arrangement by which those villages could obtain their supplies of water from the city, until they can afford to go far out into the Lake as the city has done.

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### WASHINGTON AND LASALLE STREET RIVER TUNNELS.

These structures are in the same condition as that described in the last Annual Report. The pavement in the LaSalle street tunnel is becoming very rough.

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### OUTER HARBOR.

Owing to the lateness of appropriations no important improvements were made by the United States Government to the outside harbor, except dredging sufficient to complete a channel nowhere less than 500 feet wide, beginning at the back of the breakwater, and nowhere less than  $14\frac{1}{2}$  feet deep at low water or city datum. The plan for a very important improvement proposed by Capt. J. G. Lydecker, U. S. Engineer, now in charge of this harbor, has been adopted and is to be carried out. It is the construction of a breakwater to begin about 1,000 feet

south of the south end of the present breakwater, and then on a southwesterly line about 2,750 feet, to a point on the north line of Twelfth street extended, and about 1,900 feet east of the Illinois Central Railroad tracks.

When this plan is carried out, and the necessary dredging done, Chicago will possess a harbor of refuge sufficient to accommodate all the vessels that could ever be brought into it for safety.

Capt. Lydecker has also proposed, and the Board of U. S. Engineers have approved, a breakwater about 5,000 feet long to be placed about half a mile north of the entrance to the harbor at the nearest point, and to run about S.70° E.; but the exact location of it has not yet been determined upon. When completed it will afford shelter to the anchorage ground just outside of the entrance to the harbor, not only at the mouth of the river, but it is believed, at the south end of the present easterly breakwater.

Respectfully submitted,

E. S. CHESBROUGH,

*City Engineer.*

CHICAGO, January 20th, 1879.

E. S. CHESBROUGH, Esq.,

*City Engineer :*

DEAR SIR :—In accordance with your request please find with this a brief statement of a few of the principal results of Microscopical examinations of the water of Lake Michigan, as delivered from the city hydrants.

While not claiming scientific accuracy, it may be of interest to those using the water.

It is known to most of our citizens that the water as drawn from the hydrants in the City of Chicago, is taken from Lake Michigan into tunnels at the Lake Crib, about two miles from the shore. These tunnels (there are two of them) are of brick, one five feet, the other seven feet inside diameter, placed about forty feet below the bed of the lake at the crib, and about seventy feet below the surface of the water, and connect the Lake Crib with the North pumping works. From that point the largest of the tunnels is continued under the City, some four miles, to the West pumping works. From these points the water is distributed throughout the City in cast iron mains.

About the last of August, 1878, at the close of a long heated, sultry term, two members of the State Microscopical Society, and a member of the San Francisco Microscopical Society, made in all some twenty dredgings, some inside of the Crib, others in the Lake near the Crib, and between the shore and the crib, and, with the exception of a few *Diatomaceæ*, did not find a living animal or vegetable form.

Natural waters arranged according to their chemical purity will appear as follows:—

River water,

Lake water,

Spring water.



The purest known river water is that of the river Loka in Sweden, which contains 1.25 of a grain of solid matter in a gallon. Some other waters contain a larger proportion of solids as follows:—

Croton River, N. Y.....	6 660
Cochituate.....	1,220
Schuykill.....	4,201
Delaware.....	3,535
River Clyde.....	7,860
River Dee.....	4,000
East London Water Co.....	23,510
Kent Water Co.....	29,710
Lake Michigan at the Crib.....	7,232

The solid matter in the water of Lake Michigan is very largely mineral, as is shown by the following chemical analysis of one U. S. standard gallon (231 cubic inches 58,318½ grains) of the water of Lake Michigan as analyzed by Drs. Blaney and Mariner.

Organic matter.....	1.2727
Mineral matter.....	5.9598
Sulphuric acid.....	3024
Sodium and potassium.....	1389
Chlorine.....	2083
Silica.....	3512
Lime.....	2 4796
Magnesia.....	.6789
Peroxide of iron, and alumina and phosphate.....	.0750
Carbonic acid, (combined).....	2.5043

Of the *mineral matter* they say: "These mineral contents are not by any means to be regarded as impurities, so far as the use of the water as a beverage is concerned, these earthy matters are in fact essential to the water as a beverage, and their total absence, as in distilled water, would render it unfit for such use."

What is called "freshness" or "briskness" of water, and which is necessary to render it really drinkable, is due to and increases with the amount of gases held in it, but especially of carbonic acid gas; waters highly charged with the latter being actually sparkling when agitated, like champagne wines, and from the same cause.



But a chemical analysis of water is not by any means all that is desirable or necessary. The chemist does not tell us in what form or condition he finds this solid matter, and as the water of Lake Michigan, except during or soon after a storm on the lake, or after a river freshet is too pure for the unaided eye to detect much if anything but "pure and sparkling water," let us see what a few evenings with the Microscope will tell us.

The Microscopical examinations of the contents of samples of water for the purpose of ascertaining what organisms are to be found in them should be very different from those made by the Microscopist engaged in collecting specimens. Gross misrepresentation is sometimes made respecting "*animalcula*," "*spores*," &c., and carried to their most absurd extreme in the so-called "drop of water," as sometimes pictured or exhibited for sensational purposes. Very false results will also be obtained when water has been exposed to the air and dust of a warm room, or even when in a corked and sealed bottle, as infusoria and microscopic algae will appear in a very short time, even in distilled water. It must not be taken for granted that all or any of the many organisms found in the water supply that we fail to identify, are deadly spores or anything that is harmful. Indeed they may much more reasonably be claimed as elements of purification. There is no such thing as strictly pure water ordinarily obtainable in any large quantity, but the waters of the great Northern Lakes are well known to be remarkably pure and wholesome. The Editors of the London Micrographic Dictionary say: "We regard the presence of most of those organisms which do not sufficiently affect the water to render its impurity discernable by the naked eye as a matter of little consequence. The presence of green *Conferva* Algae is by no means a sure sign of impurity (properly so-called) in water, for some will only grow in very clear and pure water while many of them may be regarded as agents of purification."

But water existing under different circumstances is one of the most fertile sources of microscopic objects, and the water of Lake Michigan is not an exception to the general rule. But as we usually find the water as drawn from the hydrants too pure

and clear to be of interest to the microscopist, it is desirable to concentrate the organic contents of a large quantity of it. For this purpose several methods are recommended, but the following is about as good as any. Take a piece of rather fine but strong white cotton cloth, about fifteen inches square, clean and free from starch, &c., fold the corners together and tie it firmly on the kitchen or laundry faucet, in the form of a bag, and let the water, some barrels of it, run through this strainer. I would here say that the proper filtering of water through cotton will entirely free it from animal or vegetable organisms. After the water has been running for a reasonable time take off the strainer and there will be a collection of sediment in the water and adhering to the inside of the strainer. Carefully wash this sediment from the strainer into the water that was in it, and put it into a glass jar or bottle, carefully covered but not corked, and let it remain an hour or two to settle. In this sediment you will have a collection of most beautiful and interesting objects for the microscope. And as the seasons, and the currents of the lake are constantly changing, each week will give many new and interesting forms. The scientific arrangement and classification of the contents of this sediment, the following of the different organisms through their various developments and to their natural homes, thus showing the direction of the lake currents, and the source from which these organisms come, would be of much scientific as well as practical value: but a more brief and popular treatment of the subject is deemed best for the place this paper is intended to occupy.

Aside from ordinary sand contained in it, about three-fourths of this sediment is composed of *Diatomaceæ*, a family of *Confervoid Algae* of very peculiar character, consisting of microscopic, brittle organisms, found in great abundance in all fresh, brackish, and salt water, that is exposed to the air and sunshine. The individual cells of *Diatomaceæ* are furnished with an external coat of silica, and these silicious shells are in great variety and of the most beautiful and symmetrical forms. The surface of the frustules are generally richly sculptured, and the markings assume the appearance of dots, stripes, ribs, pinnules, lines, bands, cells, areolæ, &c., &c., in almost innumerable varieties and com-

binations, and as most of them are composed of almost pure silica, a thorough boiling in sulphuric and nitric acids only renders them the more clear and beautiful. There are over seventy species of *Diatomaceæ* found in our lake water, embracing many of the most rare and beautiful objects, as well as some of the best known tests of the correctness and defining power of microscopic objectives. \*Among them we find *Campylodiscus costatus*, *Surirella splendida Norvegica* and *biseriata*, *Rhizosolenia Eriensis*, *Amphiprora ornata*, *Amphipleura pellucida*, *Amphora ovalis*, *Cymbella cuspidata* and *ventricosa*, *Stephanodiscus Niagarae*, *Melosira granulata*, *Asterionella formosa*, *Tabellaria fenestrata* and *flocculosa*, and several species each of *Cocconeis*, *Pleurosigma*, *Synedra*, *Epithemia*, *Pinnularia*, *Fragilaria*, *Encyonema*, *Cyclotella*, *Navicula*, *Cymatopleura*, *Gomphonema*, *Staurois*, *Tryblionella*, etc., etc. Some of them are found in the water supply in great abundance at all seasons, and naturally belong in the water of the lake, while the home of others is in the shallow water near the shore, or in the ponds and streams that discharge into the lake, and are most likely carried to the Crib by the action of storms, and River and Lake currents and are found in the water supply at a certain time, and for a season only.

Prof. E. S. Bastin includes also in our water supply many of the algæ belonging to the family of *Desmidiaceæ*, including the genus *Closterium*, of which there are at least five species, several species of *Pleurotænum* one of *Didymoprium*, one of *Desmidium*, a considerable number of *Cosmarium*, several of *Euastrum*, *Micrasterias* and *Staurostrum*, and one or two each of *Xanthidium* and *Arthrodesmus*. Among other algæ there are the *Hydrodictyon-nutriculatum*, several of the genera *Pediastrum* and *Spirogyra*, one at least of *Cladophora*, and one each of *Nostoc*, *Merismopadia*, and *Zygnema*. Several other forms are found in the more impure water inside the breakwater along shore among them several species of *Oscillatoria* and *Scenedesmus* and one or two of *Vaucheria*.

Of animal life there is an interesting variety. Of *Crustacea* we rarely find an *Isopod* or *Amphipod*. By far the greatest

number of specimens belong to the *Entomostraca*. We find *Cyclops quadricornis* and other *Copepoda*, perhaps *Calanidæ*; *Cypris*, *Daphnia*, *pulex* and *galeata*, *Sida crystallina*, *Chydorus sphaericus*; *Alona*; *Bosmina longirostris*; *Pleuroxus hamatus* and *Camptocercus macrourus*. Doubtless there are many other forms not yet observed. The *Rotifera* are represented by *R. vulgaris*, *Stentor*, etc., and at least three species of *Anurea*, *A. Stipitata* *A. aculeata*, (*Brachionus quadratus*), and a very beautiful long-spined *Anurea* that I do not find named in any work that I have. The beautiful little *Hydra* (fresh water polyp) is also sometimes found in considerable numbers. Of *Infusoria* the *Peridinia*, (*cilio-flagellata*) are represented by several species, one of which, *Ceratium-macroceras* is the largest and one of the most beautiful of all the *Peridinæ*. Yellow, with a richly sculptured cuirass, encircled with a band of cilia, the anterior end supporting a single long slender horn, and the posterior three, or sometimes but two, slightly curved ones. They are sometimes found in considerable numbers in the fall or early winter; at other times for long periods I do not find them in the water supply. Of the genus *Dinobryon* there is at least one, *D. gracile*, and I think several other species.

Of the *Rhizopoda*, we find several species each of *Diffugia* *Arcella*, *Euglypha*, *Acinæta* and others.

These are but a few of the more common of the great variety of animal and vegetable microscopic organisms found in the water of Lake Michigan and in the clear, pure water of all the great Northern Lakes, and most of them are fully as abundant in the water supply of Cleveland, Milwaukee, Detroit, and Buffalo, as in that of Chicago, and in using these waters as a beverage, one that will relish an oyster or a clam cannot reasonably object to a beautiful little *Cyclops*, a *Bosmina* or even a *Ceratium*.

But occasionally we find what is not quite so acceptable, for instance a *Tardigrada macribiotus*, (*Hufelandi*), a *Paramecium*, an *Anguillula fluviatilis*, a *Hydrachna*, a family of lively *Vorticella*, etc., that have evidently been carried out to the Lake Crib by the Lake or River currents from the breakwater or



1250 Anuraea - 1251 10

P. W. 10 10

- |                 |                  |                    |                       |                  |
|-----------------|------------------|--------------------|-----------------------|------------------|
| 1. Anurea       | 7. Bosmina       | 15. Cosmarium      | 29. Micrasterias      | 38. Chydorus     |
| 2. Pediatrum    | 9. Closterium    | 16. Euastrum       | 33. Alona             | 39. Camptocercus |
| 3. Ceratium     | 10. Euastrum     | 17. Cosmarium      | 34. Anurea            | 30. Cyclops, (m) |
| 4. Arcella      | 11. Micrasterias | 18-19. Staurastrum | 35. Pleuroxus         | 31. Ruchlania    |
| 5. Rhizosolenia | 12. Tardigrada   | 20. Cosmarium      | 36. Xanthidium        | 32. Cypris       |
| 6. Anurea       | 14. Asterionella | 21. Daphnia        | 37. Cyclops, (female) | 33. Sida crystal |





shore, where at certain seasons, they are found in great numbers, especially near the river or sewer outlets. Storms scatter these organisms in the waters of the Lake for some considerable distance from the shore, and when once taken into the tunnels and mains they continue to multiply, and a few of them can be found in the water supply at almost all seasons of the year.

Careful observation by different microscopists does not leave a reasonable doubt that nearly all of the impurities, properly so called, found in the water as drawn from the hydrants comes directly or indirectly from the sewage and River water that is discharged into the Lake. So long ago as December, 1871, Prof. H. H. Babcock, in an article in "The Lens," "*On the effect of the reversal of the current of the Chicago river on the hydrant water,*" said that the microscopic examinations by himself and others interested in the same study "are sufficient to determine the fact that the reversal of the course of the Chicago River has decidedly increased the purity of the hydrant water by removing a large part of the organisms it had previously contained, and I have no doubt that the sanitary condition of the city—so marked at the time—was promoted by this change in the character of the water supply."

Evidence in corroboration of statements like this is so abundant and easily obtained that it cannot be successfully refuted, and the only conclusion that I can arrive at is, that the purity of the hydrant water can only be maintained by preventing the discharge of all impurities into the Lake, or by extending the tunnels a sufficient distance from the shore to be beyond their influence.

Respectfully submitted,

B. W. THOMAS.

\* In preparing the illustrations for this paper I wish to acknowledge my indebtedness to Master Willie Hoskins, for several well executed drawings of *Entomostraca*, *Tardigrada*, *Arcella* & *Diatomaceae*, and to Dr. R. U. Piper for a drawing of *Ceratium marginoceras* from specimens of my own collection, and to Prof. E. S. Bastin, for the use of some of his drawings of the *Desmidiaceae*.

## STREET AND BRIDGES.

CHICAGO, Dec. 31, 1878.

HON. MONROE HEATH, *Mayor*,*In charge of Department of Public Works.*

DEAR SIR: -The third annual report of the Street Department of the Department of Public Works is hereby respectfully submitted:

There has been completed 11.42 miles of street improvements in the city during the past year as follows: wooden block pavement 9.13 miles; macadam, stone and cinders 1.90 miles, and curb-stone wall and fill, 0.39 miles.

The watch and bell towers for engine houses Nos 3 and 17 were completed March 14th; also the bridge at North avenue, January 19th, mentioned in the last report as not being complete.

Upon a general plan and specifications prepared by this department for a viaduct at Eighteenth street, over the tracks of the Pittsburg, Fort Wayne and Chicago R. R.; Chicago, Alton and St. Louis R. R. and Lumber street, bids to be accompanied by plans were invited from all bridge companies for the super-structure (rejected plans to be returned to the company sending them) May 10th, 1878; also, bids for the sub-structure at the same date; but owing to a disagreement among the property owners in regard to location of the side approach, between Lumber street and the River, which was finally settled by the adoption of the original plan; the work was not awarded until August 1, 1878, delaying the work some three months. The plan and detail of the Keystone Bridge Company, of Pittsburg,



Pa., being accepted, a contract was made between the city and said company, August 3d, 1878, and the viaduct completed December 18th, 1878, at the contract price, \$11,194.00. The bridge is built of the best quality of iron, is done in a workman-like manner, and is in every respect a superior bridge and an ornament to the City of Chicago.

The contract for the sub-structure was let to James Clowry, and contract made August 3d, 1878, but will not be completed, including paving, etc., until some time early in 1879. It is so far completed, however, that travel commenced Dec. 20th, 1878.

Owing to the breaking of a derrick, which dropped a heavy dimension stone on a main water pipe, an additional expense of \$74.40 was incurred.

Below will be given in detail the amount expended to date:

On account of sub-structure.....	\$10,403.43
On account of super-structure.....	5,000.00
Salary of Engineer and Inspector.....	1,642.50
Advertising .....	76.23
Repairing main.....	74.40
Amount expended to date.....	<u>\$17,196.56</u>

By order of the Council, passed July 22, 1878, the fences around Union and Jefferson Parks were removed which seems to give satisfaction to the general public.

Owing to improvements on the North Branch of Chicago River, above Fullerton avenue, a portion of the pile bridge at that place had to be taken down to admit of navigation, making it useless for travel. The bridge was of pile bents, 225 feet long by 20 feet in width, and was constructed by Fox & Howard, by contract of November 9, 1874, price \$1,490.

By reason of the above, a swing bridge was necessitated and a contract was made with the firm of J. W. Savin & Co., October 1st, 1878, to erect a combination swing bridge and pile

center pier, from a design prepared by this department, at a cost of \$2,977.50, to be paid for as follows:  $\frac{1}{2}$  by the Town of Lake View and  $\frac{1}{2}$  by the City of Chicago.

The completion of the bridge was delayed by reason of the extreme cold weather but will be completed some time in January in 1879. The dimensions are 125 feet on line of chord, 17 feet  $\frac{1}{2}$  inches width of roadway, 1 foot 4 inches width of chords and 20 feet width over all.

There has been paid by estimate No 1, \$1,955.00 on account of contract.

For further particulars in regard to bridge repairs, etc, I respectfully refer you to the report of Mr. J. K. Thompson, in charge of bridges.

GEORGE W. WILSON, Esq.

*Superintendent of Streets and Bridges.*

SIR:—I herewith submit my annual report of repairs of bridges and viaducts for the year ending December 31st, 1878.

The bridges and viaducts are all in such repair as to be secure from accidents, with the following exceptions. The center bearings of Lake street bridge are badly decayed and unsafe, and should be renewed entire by putting in new timbers, I would recommend that this work be done at once, as the material for the work is now on hand.

The west approaches at Randolph and Kinzie street bridges require to be rebuilt by putting new pile and timber work as soon as practicable, as they are rotten and apparently unsafe.

The viaduct over the N. W. R. R. at Erie street is in bad condition and should be strengthened by additional supports under the trusses, the bottom chords of which are in many parts con-

siderably decayed. These improvements when done will put all the bridges and viaducts in a safe condition.

The roadway of the following bridges were replanked: Clybourn place, East Division and West Division street bridges, and new sidewalks were laid on East and West Division streets, Chicago avenue, Kinzie, Lake, Throop, VanBaren and Polk street bridges and on the viaduct at Sixteenth and Halsted streets.

The planking on roadways and sidewalks of nearly all the bridges and viaducts have been extensively repaired, and the approaches to several of the bridges have been renewed. The center protection at Randolph street bridge has been thoroughly repaired by putting in new timbers and covering the entire surface with new joist and planking. The same has been done at Lake street bridge to a large extent. New protection piles have been driven at Randolph, Harrison and Eighteenth street bridges to protect the approaches. New bearing wheels were placed under the turntable at Throop street bridge, and new end bearings at several of the bridges. The following bridges were painted; Fuller street, Throop, Eighteenth, Lake, Wells, Clark, North avenue and North Halsted street, and the viaducts at Sixteenth and Canal streets and Sixteenth and Halsted streets. I would again urge the necessity for a new turntable under State street bridge for the reasons given in my last report.

The expenditures for bridges and viaducts during the past year is as follows:

Adams street bridge.....	\$ 450.36
Archer avenue and slip bridge.....	80.55
Archer avenue bridge.....	141.06
Ashland avenue bridge.....	130.14
Bridge department, miscellaneous.....	1,222.61
Clark street bridge.....	774.77
Chicago avenue bridge.....	309.85
Clybourn avenue bridge.....	362.77
Division and River bridge.....	635.62

Division and Canal bridge.....	617.21
Erie street bridge.....	690.79
Eighteenth street bridge.....	574.93
Fuller street bridge.....	124.65
Halsted and Canal street bridge.....	284.68
Harrison street bridge.....	276.01
Indiana street bridge.....	132.52
Illinois and Michigan Canal bridge.....	35.80
Kinzie street bridge.....	455.90
Kedzie avenue bridge.....	25.98
Lake street bridge.....	1,303.28
Madison street bridge.....	375.71
Main street bridge.....	4.40
North avenue bridge.....	503.51
North Halsted street bridge.....	182.74
Polk street bridge.....	240.92
Rush street bridge.....	555.37
Randolph street bridge.....	1,063.22
South Halsted street bridge.....	577.04
State street bridge.....	691.40
Twelfth street bridge.....	670.83
Twenty-second street bridge.....	292.69
Throop street bridge.....	394.73
Thirty-fifth street bridge.....	91.52
VanBuren street bridge.....	417.66
Wells street bridge.....	799.80
Western avenue bridge.....	157.72
Total for bridges.....	\$15,651.74

## VIADUCTS.

Adams street viaduct.....	265.40
Blue Island avenue viaduct.....	2.50
Clark street viaduct.....	197.75
Canal street viaduct.....	423.93
Desplaines street viaduct.....	2.00
Erie street viaduct.....	315.04

## THE DEPARTMENT OF PUBLIC WORKS.

107

Indiana street viaduct.....	14.25
Lake street viaduct.....	36.00
Milwaukee avenue viaduct.....	2.50
Madison street viaduct.....	98.12
North Halsted street viaduct.....	90.94
Randolph street viaduct.....	95.62
South Halsted street viaduct.....	357.30
State street viaduct.....	418.63
Twelfth street viaduct.....	85.92
Wells street viaduct.....	179.43

Total amount for viaducts..... \$2,585.33

Salary of superintendent in charge of bridge repairs, etc.....	\$ 1,500.00
Horse-keeping.....	180.00
Total amount for bridges.....	15,651.74
Total amount for viaducts.....	2,585.33

Total cost.....\$19,917.07

The itemized account of material and cost of same is as follows:—

Salary of foreman.....	\$ 1,500.00
Labor of carpenters, etc.....	7,475.87
Lumber.....	5,999.98
Painting bridges.....	1,371.00
Iron work.....	586.47
Rent of lot.....	450.00
Coal.....	493.45
Driving piles.....	470.80
Nails.....	368.50
Oil.....	327.95
Damage to vessels.....	209.98
Castings.....	196.57
Oars.....	20.00
Brooms.....	49.00
Barrows.....	11.00
Rope and oars.....	47.45

Signal balls.....	31.35
Hardware .....	59.66
Advertising .....	9.83
Lanterns and repairs.....	28.61
Repairing clocks.....	14.06
Repairing stoves.....	37.18
Bells ... ..	64.81
Masonry .....	44.37

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\$19,867.96

The difference in amount between "bridge account" and the account of material, is caused by some 1878 bills not having been returned before closing of books, which will be shown in 1879

J. K. THOMPSON,

*In charge of Bridges.*

## STREETS.

The number of miles of improved streets in the city to date is as follows:

Wooden blocks.....	109 <sup>2115</sup> <sub>5280</sub>
Cindered.....	8 <sup>8267</sup> <sub>5280</sub>
Graveled.....	8 <sup>794</sup> <sub>5280</sub>
Macadamized.....	5 <sup>4657</sup> <sub>5280</sub>
Stone.....	0 <sup>8271</sup> <sub>5280</sub>
Total number of miles.....	132 <sup>4244</sup> <sub>5280</sub>

It will be seen by reference to the following tables, showing the street improvements for the year 1878, that the business center has received particular attention in regard to street improvements.

The Court House Square has been paved on three sides, namely: Randolph, Washington and LaSalle streets, with wooden blocks of the nature of the "Nicholson patent."

The property owners regard the "Nicholson patent" and the cedar block on floor with composition with more favor than within a few years past, it having been shown that the composition, if properly applied, prolonged the life of the wooden pavements, as in the case of numerous streets that have been repaved during the past year, the blocks being in a perfect state of preservation and worn by travel to less than one-half ( $\frac{1}{2}$ ) of their original height.

In seventy per cent. of the work done, composition was used. There has been a desire manifested by the property owners to dictate as to the manner, kind of pavement, etc., there being over ninety-six (96) per cent. of the paving done this year by private contract. The department having a general supervision over the improvement, private contract or assessment as the case may be.

By the completion of that portion of S. Halsted street remaining unpaved last year, between Archer avenue and Egan

avenue and Archer avenue and the south branch of river, and on the north side, by walling and cindering, from north branch of river to Division street, and paving from Clybourn avenue to Sophia street, there is remaining unimproved (except by walling) about 2,300 feet or a little less than one-half mile, with every prospect of even that being done next year, making complete a street seven (7) miles in length, from the north to the south city limits.



# REPORT OF STREET IMPROVEMENTS IN THE SOUTH DIVISION FOR THE YEAR 1878.

NAME OF STREET	FROM AND TO.	CON- STRUCTED	FIN- ISHED	CONTRACTOR	NATURE OF IMPROVEMENT	Linear feet	Square Yards	REMARKS
Market street	Washington st. to Randolph	April 12	May 3	J B Smith	8 in cedar, on 1 to floor & comp	459 00	5637 70	
Washington street	Dearborn st. to State st.	" 29	" 29	W H Watson	1 in cedar, 1 in floor & comp	322 00	1788 34	
Madison street	Clark st. to Dearborn st.	May 14	" 22	J C McBrat	8 in cedar, 1 in floor & comp	386	2404 01	
8th street	130 feet north of 25th to 31st	" 21	June 20	Macdon & Healey	8 in cedar, 1 in floor & comp	2484 54	11927 24	
8th street	Fifth avenue to Lake street	June 12	July 13	J B Smith	6 in cedar, 1 in floor & comp	945	5707 80	Engineering done by O H Cheney
Westworth ave	22d st. to 25th st	" 17	Nov 4	J B Smith	6 in cedar, 1 in floor & comp	856	1782 44	
Twenty seventh st	Johnson av. to Cottage Grove	" 19	June 28	J B Smith	6 in hemlock, 1 in floor & comp	080	1222 32	Nicholson paid m 7
Clark street	Park st. to Twelfth st	" 20	Nov 12	Ray & Whitney	6 in cedar, 1 in floor & comp	1024	9134 30	in front by 108 s.s.a.
8th Halsted street	4th Chicago to Overtoe Archer av	" 27	July 25	Macdon & Healey	5 in cedar, 3 in floor & comp	07 57	2729 40	Only 18 ft in centre of st. repaved by order of Council
Walworth avenue	29th st. to 31st st	July 15	" 31	J B Smith	5 in hemlock, 1 in floor, lake shore gravel	3484 5	69409	Exc 3 25 ft done with 3 1/2 ft flag for foundation.
Dearborn street	Madison st. to Monroe st	" 17	" 27	Ray & Whitney	8 in cedar, 1 in floor & comp	390 0	2201 38	
Monroe street	State st. to Clark st	" 22	Aug 14	E S Detolyer	5 in pine, 3 1/2 in floor & comp	753 5	1441 2	
Monroe street	Clark st. to Fifth ave	" 26	Sept 3	W H Watson	7 in cedar, 2 in floor & comp	753 6	3883 50	
Alley in b 119 s.s.a	Dearborn st. w 5 ft w Dearborn	Aug 13	Aug 14	Ray & Whitney	6 in cedar, 1 in floor & comp	87 7	257 8	
Couch place	Clark st. to Dearborn st	" 15	" 20	A L Ierkus	6 in cedar, 1 in floor & comp	322	634	
Thirty first street	8 Park av. to 100 ft. w of 8 Park av	" 27	" 27	J B Smith	4 x 6 in pine, 1 in floor, lake shore gravel	100	211 11	
LaSalle street	Monroe st. to Washington st	" 29	Oct 10	Ray & Whitney	7 in cedar 2 in floor and comp	4802 62	4802 62	Intersection of Madison st. not repaved
Eighteenth street	Walworth ave. to LaSalle ave	Sept 6	" 15	N Detolyer	8 in cedar 1 in floor and comp	723 6	7090 97	
Washington street	Clark st. to Dearborn st	Sept 6	Sept 27	Ray & Whitney	8 in cedar, 1 in floor and comp	401 31	2920 06	16 ft. in centre of st. repaved by order of Council.
Fulton avenue	Cottage Grove ave. to 30th st	" 10	Oct 12	J B Smith	4 x 6 hemlock 1 in floor, lake shore gravel	3635 5	6571 82	out of st. fund
Pacific avenue	Park st. to Taylor st	" 23	Nov 9	Albion Medburn & Co	Medina stone paving	834	3045 68	Intersection of Fif have not repaved.
Randolph street	Clark st. to S.B. Chicago river	" 28	" 4	A J & D D McBean	8 in cedar, 1 in floor and comp	1717 2	9282 2	
Calhoun place	LaSalle to 340 ft w of LaSalle	Oct. 10	Oct 14	Ray & Whitney	6 in cedar, 1 in floor and comp	240	420	
Eighteenth street	State st. to Cottage st	" 22	Nov 21	W H Watson	7 in cedar, 2 in floor and comp	1032 8	7446 90	
LaSalle street	Washington st. to Randolph	" 31	" 23	Ray & Whitney	7 in white pine with strips, 2 in floor and comp-sition	329 73	2018 00	

\*NOTE—Streets marked with a star were improved under special assessment, the others by private contract between property owners and contractors, the city paying for interest only, and the contractors paying the city for engineering and superintending



# REPORT OF STREET IMPROVEMENTS IN THE WEST DIVISION FOR THE YEAR 1878.

NAME OF STREET	FROM AND TO	COM- MENCED	FIN- ISHED	CONTRACTOR	NATURE OF IMPROVEMENT	Linear feet.	Square Yards	REMARKS.
School street	Desplaines st to w. l. of b 24 s 8	April 29	May 4	Andrew Jaleks	6 in pine, 4 in. floor ...	404.	713 86	Special assessment
Adams street	Hoyt ave to Irving ave	June 10	Aug 10	Madam & Barret	6 in. cedar, 1 in. floor and comp	1024	4700 71	Private contract
Hoyle avenue	Madison st to Congress st	Sept 18	Oct 21	W H Watson	6 in cedar, 1 in. floor and comp	5114	10644 71	Private contract
McWacker ave	Lake st to Fulton st	Oct 7	Oct 21	W H Watson	6 in cedar, 1 in. floor and comp	482	2341 19	Special assessment
Madison street	First st to Third st	Sept 7	Nov 22	J B With	6 in cedar, 2 in floor and comp	2548	14598 22	Private contract
Chubb street	Madison st to Madison st	May 17	Nov 6	Thos Morkin	6 in cedar, 1 in floor ..	2048	14766 22	Private contract
St. Washington st	Madison st to Lake st	May 16	June 14	W H Watson	6 in cedar, 1 in floor ..	1318	7388 31	Private contract
Harold street	Cuba st to Alley west	June 6	"	W H Watson	6 in cedar, 1 in floor ..	100	4908 17	Private contract
Madison street	Randolph st to Madison st	Nov. 18	"	J B Smith	6 in cedar, 1 in. floor and comp	991	7369 17	Private contract
Arbor place	Madison st to Madison st	Sept. 12	Nov. 18	Rd & Whitney	6 in cedar, 1 in. floor and comp	134	137 24	Private contract
Chicago avenue	Wood st to Grand ave	Sept. 12	Dec 20	J. H. N. ry ..	Macadamizing 24 feet wide ..	7141	20244 36	Special assessment
Randolph street	Desplaines st. to Clinton st	Dec. 9	"	W H Snow	6 in cedar, 1 in. floor and comp	752	4108 36	Private contract
						25411	85784 41	

Total, 3.88 Miles Paving.

During the past year a new method of street cleaning was adopted and executed. The contract for sweeping only, was let as usual, the department retaining an extra force for the purpose of taking up the sweepings and removing the same. A large amount of street cleaning, independent of the sweeping, was also done by this force. Below will be given tables, showing work done by sweeping contract and the extra work done by the city's force.

The streets have been kept in as cleanly and satisfactory a condition as in former years.

The contract for sweeping the improved streets was let May 8th, the first work was done May 14th, and continued until Oct. 25th, 1878.

## SWEEPING CONTRACT.

DIVISION	May	June.	July.	August.	Sept	Oct	Total Miles.
North .....	13 28	15 71	18 81	17 88	23 40	13 57	102 63
South .....	15 30	15 12	58 79	62 06	54 36	50 61	286 24
West .....	11 80	17 49	32 62	25 61	45 26	43 32	176 10
Miles .....	40 38	78 32	110 22	105 53	123 02	107 50	564 97

Cost of cleaning the above by B. B. Cunningham's contract, at \$5.00 per mile, \$2,824.85.

In addition to (and not including the above) the following extra work was done by the city's force.

## EXTRA WORK.

DIVISION.	May	June	July.	Aug.	Sept.	Oct.	Nov.	Dec	Total Miles
North. ....	14.10	1.85	5 49	9 88	3 66	1 79	8 85	.....	45 62
South .....	4 55	9 08	9 92	24 54	16 61	17 94	32 34	4 45	120 43
West .....	.....	8 29	15 75	19 81	15 12	9 04	13 68	2 13	83 82
Miles .....	18 65	19 22	31 16	54 23	35 39	28 77	55 87	6 58	249 87

Cost per mile, for cleaning 814.84 miles, as represented by

the preceding two tables, \$20.15, being 10 cents less per mile than that paid for same work last year, at the same time there was a large amount of work done that was not classified as street cleaning, there being numerous alleys cleaned, and in the latter part of December, 7.78 miles of crossings, in the district between Jackson street and the river; south branch of the river and Michigan avenue.

The following table gives in detail the miles of street cleaning done (both improved and unimproved), cindered, macadamized, etc, by the regular foremen of this department.

NORTH DIVISION.			SOUTH DIVISION.			WEST DIVISION.		
Paved streets cleaned	Unimproved streets cleaned.	Cindered streets repaired, etc.	Paved streets cleaned.	Unimproved streets cleaned	Graveled and cindered streets repaired, etc.	Paved streets cleaned.	Unimproved streets cleaned.	Macadamized streets repaired, etc.
39.16	78.25	1.08	46.46	64.90	4.95	119.79	115.09	8.27

Total number of miles cleaned and repaired as shown, 477.95. Streets in the above table have been cleaned from one to four times each during the year, special attention having been given to the principal streets.

All bridges and viaducts, approaches and alleys, have been cleaned and all debris, etc., collected and removed.

In the north-west division there was 102.75 miles of gutters disinfected with lime during the extreme heated term, and was paid for by this department, the lime being furnished free.

COST OF STREET REPAIRS.

Division	Cleaning improv- ed streets	Repair- ing streets.	Lumber.	Blocks.	Hard- ware, nails and repairs.	Gravel.	Stone and M'cadam	Cinders.	Rent of lot.	Cement, sand, etc.	Adver- tising.	Horse keeping	Repair- ing Wabash ave.	Repair- ing Prairie ave.
North . . . . .	516.70	21,658.11	756.14	1,931.72	179.61	155.00	.....	350.00	25.00	.....	42.60	32.25	.....	.....
South . . . . .	1,436.18	30,374.10	1,714.38	2,802.16	778.00	56.00	118.00	185.72	.....	.....	.....	92.50	3,683.57	3,854.04
West . . . . .	871.97	56,179.13	4,503.78	2,620.03	795.49	27.00	771.58	200.00	25.00	.....	48.89	70.00	.....	.....
Amount . . . .	\$2,824.85	108,211.34	6,974.30	7,353.91	1,753.10	238.00	889.58	735.72	50.00	149.62	91.49	194.75	3,683.57	3,854.04

Total amount, \$137,014.27, less by amount received for repaving, \$1,011.37, true cost, \$136,002.90.



The construction of sidewalks during the past year, as shown by the Inspectors reports, and not embracing sidewalks built under special assessment contract, is as follows:

## SIDEWALKS.

DIVISION.	Pine.	Stone	Concrete	Recon- structed.	Total.
North. . . .	6,884	2,760	210	25,060	35,804
South . . . .	2,825	1,594		11,446	35,865
West .. . .	1,225	1,008	360	64,871	67,464
Total . . . .	10,934	5,362	570	122,277	139,133

In addition to the total number of feet as shown (139,133 feet,) a large amount of repairing was done by the street foremen.

The following work has been done by the carpenters under head of repairs, together with the kind and quantity of lumber and for what purpose used :

## REPAIRS

FOR WHAT USED.	NORTH DIVISION				SOUTH DIVISION				WEST DIVISION			
			Lumber				Lumber				Lumber	
	No.	Sq Yds.	Pine	Oak	No.	Sq Yds.	Pine	Oak	No.	Sq Yds.	Pine	Oak
Aprons	389		2832		267		12730		521		41275	924
Crossings, street . . .	80		13869	1075	54		7075	4608	482		4098	13325
Crossings, alley . . .	55		3570	805	17		2242	559	236		10764	1539
Culverts, street . . .	46		5341	468	56		8227	6092	226		34726	17120
Culverts, alley . . .	11		733		53		4430	624	180		3069	946
Drain boxes . . . .	5		1072		4		309	32	37		6657	
Paving, general repairs		918				14402				9877		
Paving, gas company										290		
Paving, sewer . . . .		11				208				20		
Paving, water . . . .		192				315				140		
Paving, street permits..		390				86				427		
Sidewalk, general repairs			18322		29		22758		68		51304	
Sidewalk, steps . . . .	121		3447		26		187		43		91	1089
Sidewalk, railings . . .	66		3552		8		572		43		2657	
Sidewalk, intersections	197		12638	28	36		6480		46		15392	
General repairs . . . .				268			12922	99			15444	3487
Approach 2d st. bridge							4319	12076				11253
Approach 1st st. bridge												1000
Approach 1st st. bridge							9128	7624				896
Approach Clark st. b/g							1450					
Approach from bridge							157360					
to Arch Ave												
25th st. 1 1/2 ft. off Halsted							11000					
City Hall underground							15000					
Fire dept. at Archer							1000					
& Dearborn st. 1/2												
	562	10135	73474	2044	844	15792	277000	33334	1838	20461	219243	80170

THIRD ANNUAL REPORT OF  
SUPPLIES.

The number of kegs of nails used was 423, as follows :

North Division.....	44
South Division.....	97
West Division.....	139
City Hall. ..	5
Bridges .....	111
Viaducts .....	27
Total number.....	423

The Bridge Department used 371 gallons carbon oil ; 277 gallons lard oil, and 118 tons of coal.

The Street Department used 146 yards of gravel ; 2,330 yards stone and macadam, and 2,541 yards of cinders.

The City Hall has used 100 feet of ash and 600 feet of B. walnut.

LUMBER.

	Pine.	Oak .	Pine Timber.	Oak Timber.	Hemlock Blocks.	Pine Blocks.	Cost.
Street Department.	321,307	.. ..	.....	.....	.....	.....	3,189.85
“ “ ...	.. ..	129,158	.....	.....	.....	.....	2,541.33
“ “ ..	.....	.....	.....	.. ..	438,391	.....	4,227.88
“ “ ..	.....	.....	.....	.. ..	.....	252,779	2,910.47
City Hall.....	18,132	.....	.....	.....	.....	.. ..	286.15
Bridge Department	130,681	.....	.....	.....	.....	.....	1,586.87
“ “ ..	.....	219,250	.....	.....	.....	....	4,187.04
“ “ ..	.....	.....	8,486	.....	.....	.. ..	90.85
“ “ ..	.....	.....	.....	4,177	.....	.....	101.18
	470,120	348,408	8,486	4,177	438,391	252,779	19,121.62

CHICAGO, January 1, 1879.

GEORGE W. WILSON, Esq., *Superintendent*,

DEAR SIR—I herewith submit my report for street lamps made and repaired for the year 1878.

On the first of February the city commenced making and repairing their own street lamps, having opened a shop at 18 South Halsted street for that purpose.

At the end of the year 1878 there were 10,785 street lamps in the city (an addition of 71 lamps during the year) divided among the three divisions of the city, as follows, to wit.:

West Division.....	5,481
South Division.....	3,121
North Division.....	2,183
Total.....	<u>10,785</u>

The total number of lamps repaired during the year aggregated 17,136.

The total number of lamps repaired with glass amounted to 15,067.

The number of lamps on which the tin work was repaired, painted, and glass put in, 1,703.

During the year 366 lamps were condemned and replaced by new ones.

The average number of lamps broken was 47 per day.

The gas companies have put in most of the glass during the year, the city furnishing the glass.

The lamp now made by the city is much stronger than any former lamp. The socket and bottom plate is of cast-iron in

one piece, the astrals or uprights are of malleable iron, with catches for the glass cast on them; the door is hinged at the top with brass hinges, and has a catch of malleable iron at the bottom; the upper and door glass all slide into frames. This lamp costs less than any lamp the city has used. 427 of the lamps repaired have had the new sides and sockets put on them, making them almost as good as new. All the lamps repaired are done in a thorough manner and painted.

There was used for glazing 501 boxes of glass containing 10,545 side lights, 4,256 door lights, 6,656 top lights—in all 21,457 lights.

The cost was as follows :

Repairing and painting tin work.....	\$1,020.80
Repairing half new and painting.....	725.90
Cost of new lamps.....	1,061.40
Cost of glass.....	1,550.10
Cost of glazing done by city.....	180.80
Total.....	\$4,539.00

In addition to the above there were miscellaneous expenditures as follows, to wit.:

Tools for shop.....	\$102.95
One wagon and harness.....	100.00
Horse feed, shoeing, repairing wagon and harness..	52.55
16½ gross brass checks for gas burners, 10 gross brass pillars for burners, 30 gross lava tips for burners...	209 00
Union foundry for lamp posts.....	24.00

Respectfully submitted,

JOHN STEWART,

*Superintendent Lamp Department.*

Your attention is directed to the following showing of Parks, and cost of maintaining same, during the past year :

## WASHINGTON PARK.

Salary of foreman.....	\$483.30
------------------------	----------

## ELLIS PARK.

Labor.....	\$480.00	
Trees.....	187.50	
Filling.....	23.50	
Hardware.....	10.25	
	<u>          </u>	\$701.25

## LAKE PARK.

Labor .....	\$1,389.18	
Coal.....	4.75	
Trees.....	48.00	
Tools . . . . .	2.35	
Two new mowers and repairing.....	50.48	
Sprinkling.....	50.00	
	<u>          </u>	\$1,544.76

## UNION PARK.

Labor....	\$1,115.56	
Feed .....	296.94	
Sewer .....	57.60	
Cement, coal and hardware.....	14.10	
	<u>          </u>	\$1,484.20

## JEFFERSON PARK.

Labor .....	\$697.50	
Feed.....	38.03	
Cement and coal.....	19.25	
	<u>          </u>	\$754.78

THIRD ANNUAL REPORT OF  
VERNON PARK.

Labor .....	\$860.50	
Repairing mowers .....	4.00	
		\$864.50

WICKER PARK.

Labor .....	\$667.12
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HARBOR.

By reason of the continued high water in the river, (averaging 2.14 feet above datum) dredging has not been necessary.

Respectfully submitted,  
GEO. W. WILSON,  
*Superintendent.*

RECAPITULATION.

I herewith present a statement of the Improvements made, (streets, bridges, viaducts, etc.,) from January 1st, 1876, to December 31st, 1878. inclusive.

STREETS.

The number of miles of improved streets in the City January 1st, 1876, was

Wooden block .....	94 <sup>0228</sup> <sub>5280</sub>	
Cindered .....	8 <sup>2825</sup> <sub>5280</sub>	
Graveled .....	8 <sup>2718</sup> <sub>5280</sub>	
Macadamized .....	6 <sup>0872</sup> <sub>5280</sub>	
Stone .....	0 <sup>5181</sup> <sub>5280</sub>	
Miles .....		118 <sup>0709</sup> <sub>5280</sub>

Miles Dec. 31st, 1876.

Wooden block.....	101	4171 5280
Cindered.....	8	2876 5280
Graveled.....	8	2698 5280
Macadamized.....	5	2851 5280
Stone.....	0	2798 5280

Miles.....

1244329  
5280

Miles Dec. 31st, 1877.

Wooden block.....	105	5178 5280
Cindered.....	8	2845 5280
Graveled.....	8	1258 5280
Macadamized.....	6	0245 5280
Stone.....	0	2817 5280

Miles.....

1291278  
5280

Miles Dec. 31st, 1878.

Wooden block.....	109	2115 5280
Cindered.....	8	8967 5280
Graveled.....	8	0794 5280
Macadamized.....	5	4657 5280
Stone.....	0	8271 5280

Total miles to date.....

1324244  
5280

Although there has been a total of 332844 miles of street improvements done, only 148585 miles are represented into table of improved streets, there being 184589 miles of streets repaved. The miles of streets improved during the past three years, together with the increase or decrease of the several kinds of pavements, in the total miles of improved streets, are herewith represented :

Kind of Improvement.	Miles	Feet	Decrease.		Increase.	
Wooden block.....	30	5167	.....	.....	15	1887 5280
Cindered.....	0	1622	.....	.....	0	1642 5280
Graveled.....	.....	.....	0	1919	.....	.....
Macadamized.....	1	4986	0	1495	.....	.....
Stone.....	0	1629	0	1860	.....	.....
	38	2844 5280	0	5274 5280	15	8529 5280

### THIRD ANNUAL REPORT OF BRIDGES CONSTRUCTED.

Location	Description of Bridge	Contractors	Year.	Cost
N. Halsted & Ry	Combination swing-bridge and turn table	Wm. B. Howard	1877	\$ 4,390.00
Fuller street.	Combination swing bridge and turn table	" " " Atty for G. W. James	1877	4,210.00
North avenue.	Combination swing bridge and turn table, pier center-pier, protection and abutments	Conroy, Clark & Co.	1877	7,149.00
Harrison street	Wrought iron swing bridge and turn table, pier center pier protection abutments and approaches thereto	American B. Co.	1877	24,875.00
Fullerton avenue	Combination swing bridge and pier center pier	J. W. Savin & Co.	1878	1,983.01
Cost				\$42,407.01

NOTE: The actual cost of the Fullerton Avenue bridge was \$2,977.50, one-third being paid for by the Town of Lake View and two-thirds by the City.

### VIADUCTS.

Location		Contractors	Year.	Cost.
Blue Island ave	Super structure ... ..	Keystone B Co	1876	* 16,871.00
Inter of Throop st	Sub structure .. ..	Cox Bros	1876	80,552.50
Milwaukee avenue at	Super structure, } south part } north part	American Bridge Company...	1876	25,320.15
Intersection of Des Plaines and Kinzle streets	Sub structure. ... ..	Leighton B. Co	1876	34,680.00
Intersection of Des Plaines and Kinzle streets	Raising of buildings	James Kincaid	1876	73,442.38
			1878	90,000.00
				\$330,936.12

The whole number of bridges in use is 35, most of which have been rebuilt, making 5,511 lineal feet, at a cost to date of \$1,047,046.00. Number of viaducts 16, making 4,493 lineal feet and costing \$705,339.55, and making a grand total of 51 bridges and viaducts, 10,004.72 lineal feet of bridge and viaduct, costing to date, \$1,752,385.55.

GEO. W. WILSON,

Supt.



## SPECIAL ASSESSMENT DEPARTMENT.

CHICAGO, January 1, 1879.

Hon. MONROE HEATH, *Mayor*,*In charge Department Public Works.*

DEAR SIR—I submit herewith, in tabular form, a statement of Special Assessments made in this Department during the past year, with a summary of the cost of the same. Also a recapitulation of the number of miles of street improvements of the various kinds, the number of lamp posts, the number of miles of sidewalks in the city, and the amount of Special Assessments made in each year during the past eighteen years.

In my report of January 1, 1877, I called attention to the system of paving streets by private contract, in which I predicted that the system would soon be abandoned, and the method changed so that a large proportion of the work would be done under contract with the city. The prediction then made has not been fulfilled as fully as I then expected, but the reasons then given in favor of the desirability of such a change, have grown stronger with each passing year.

Under the system of having all paving done under the ordinances and direction of the city, due notice was given, and time taken, to have all streets proposed to be paved, furnished with the necessary water, sewer, and gas pipes, before any steps were taken towards paving, while under the private contract system, the first notice the city receives of the intention of having a street paved, is the passage of the contractor's order, by the Council, directing the Department of Public Works to grant them (the contractors) a permit to pave the street named. Then the required pipes have to be hurriedly put in, immediately in advance of the paving, and the consequence is, no solid foundation for the pavement can be made, and the street so

paved requires repaving at one end very soon after having been completed at the other. The greatest trouble with our wooden block pavement has been caused by defective foundations, and there can be no remedy for the defect as long as the streets are honeycombed with trenches for the various kinds of pipes, dug immediately in advance of the paving. These pipes should be laid at least one year in advance of the paving, to secure an even and solid roadway, and, until this rule is adopted, I very much fear we shall have but few pavements which will not need repairing in a very short time after completion. It remains an unexplained problem why property owners are willing to submit to this state of affairs, but an even greater mystery why they should prefer to pay a larger sum for having the same work done by private parties, than it could be done for in case there was a competitive bidding, and letting to the lowest responsible bidder. If this preference affected them alone, of course it would be their own affair, but the city at large comes in for its share of the additional cost in the following manner. The contractors, when they have succeeded in securing the signatures of owners of three-fourths of the property on any given street, are generally successful in having an order passed by the City Council, directing the Department of Public Works to grant a permit for paving in front of the property enumerated in the private contract, and in the same order is embraced another one directing the Department to contract with them for the City's portion, (the intersections) at the same price as that *purported* to be paid by private parties, and, in addition to this, another order to make a Special Assessment on the private property not embraced in the private contract, and to let the contract for *this* portion also to the same contractor, at the same price. Thus it will be seen, the city, and the owners of one-fourth of the private property, who have not signed the private contract, are compelled to be led blindfolded in the footsteps of the three-fourths who have unwittingly entered into an agreement to pay a larger sum than is really necessary for the improvement of their property.

During the term of one Alderman (who, unfortunately for the interests of the city, declined a second term,) by an unfailing

perseverance on his part, many of these orders, drawn by the contractors, were amended so that the City's portion was required to be let to the lowest responsible bidder. Without an exception, where this was done, the city made a large saving. To substantiate this statement, I cite a few instances of work done under orders thus amended, showing the difference in cost between the two systems.

For curbing, filling and paving Peoria street, from West Randolph street to West Harrison street, the parties to the private contract paid \$4.75 per front foot on each side of the street. The price paid by the city under contract with the lowest responsible bidder was at the rate of \$2.92 per front foot, a saving \$1.83 per foot.

For filling and paving North State street, from Kinzie street to Chicago avenue, the property owners paid \$3.00 per front foot, the city \$1.51, a saving of nearly one-half.

For curbing, filling and paving West Indiana street, from Noble street to Hoyne avenue, the property owners paid \$4.25 per foot, the city \$2.82½.

For curbing, filling and paving Fifth avenue, from Randolph street to Madison street, the property owners paid \$5.00 per foot, the city \$3.32<sup>6</sup>/<sub>10</sub>.

I might add others to this list, but the above will be sufficient to show the desirability of dispensing with a system which is satisfactory to the few, (the contractors themselves,) and burdensome to the many.

During the past year there have been between eight and nine miles of paving done by private contract, and considering the intersections one-sixth of the whole amount, by taking the above figures as a basis, a simple calculation will show what might have been saved to the city had all the orders for private contracts been amended in the manner above referred to.

Taking these facts and figures into consideration, I can see no valid reason why the prediction made in 1877 should not soon become a reality.

## STATEMENT OF ASSESSMENTS FOR WOODEN BLOCK PAVEMENT.

No. of Ward part	NAME OF STREET	FROM	TO	Amount of Assessment
3114	Coach place	La Salle street	Fifth avenue	\$965 14
3117	Twenty second st	South La Salle street	Westworth avenue	2 687 41
3123	Canal avenue	Thirty second street	Thirty-third street	3 977 97
3125	Canal street	West Madison street	West Harrison street	1 403 71
3135	West Twelfth street	In front of lots 1 and 2	Block 2 Canal Addition	508 32
3136	Pacific avenue	Sundry lots Van Buren st	Harrison street	1 071 43
3137	State street	In front of S 123 ft. lots	Twelfth St School Sec.	519 26
3138	Sixteenth street	Sundry lots Indiana av	Prairie avenue	1 0 28
3147	Hoyne avenue	West Madison street	West Harrison street	3 018 86
3151	North Wells street	Sundry lots Chicago st	Memomonee street	2 699 86
3152	Russ street	" " Chicago av	Cedar street	725 06
3153	West Adams street	" " Hoyne av	Oakley avenue	692 35
3156	Van Buren street	Michigan avenue	So. Branch Chicago Riv	14 106 16
3157	Lake street	Fifth avenue	W. Line of Market street	8 869 06
3158	Polk street	State street	Polk street bridge	6 091 09
3159	Eighteenth street	" " "	Grove street	7 874 26
3160	Thirty first street	" " "	L S & M S R R	3 969 54
3161	Halsted street	Archer avenue	Halsted street bridge	2 027 47
3162	West Polk street	Canal street	Polk street bridge	3 187 00
3163	North Halsted st	West Ohio street	West Chicago avenue	6 386 49
3164	West Division st.	Milwaukee avenue	Division street bridge	12 673 83
3165	North Halsted st	Clybourn avenue	N. Branch Chicago Riv	17 813 07
3167	North Clark street	Sundry lots Belden av	Fullerton avenue	305 28
3187	Madison street	" " Wabash av	Michigan avenue	1 240 26
3196	Jackson street	Clark street	Dearborn street	2 095 37
3191	Bremer street	Chicago avenue	Oak street	1 539 01
3192	Canal street	Sundry lots W. Lake st	West Madison street	1 190 81
3196	North Halsted st	" " Clybourn av	So. La street	1 893 46
3197	Clark street	" " Polk street	Twelfth street	1 348 10
3198	South Water street	" " Franklin st	Lake street	551 45
3199	Wentworth avenue	" " 22nd street	Twenty-ninth street	7 414 98
3220	Monroe street	" " State street	Clark street	797 05
3222	Monroe street	" " Clark street	Fifth avenue	1 044 83
3223	Washington street	" " "	Dearborn street	787 02
3224	La Salle street	" " Washington st	Monroe street	1 262 94
3225	Canal street	" " W. Madison	West Harrison street	3 328 54
3226	West Madison st	" " Canal street	Halsted street	3 095 99
3230	Michigan street	North State street	40 ft. E. of Dearborn av.	2 060 40
3250	Randolph street	Sundry lots Clark street	Market street	1 961 29
3251	Hoyne avenue	" " W. Madison	West Harrison street	1 294 37
Total				\$145,870 49

## STATEMENT FOR ASSESSMENTS FOR MEDINA BLOCK STONE PAVEMENT.

No. of Ward part	NAME OF STREET	FROM	TO	Amount of Assessment
3172	Sherman street	Van Buren street	Polk street	\$22 477 83

STATEMENT OF ASSESSMENTS FOR MISCELLANEOUS STREET  
AND ALLEY IMPROVEMENTS.

No. of War- rant.	Nature of Improvement	Name of Street.	From	To	Amount of Assessm't.
317	Graveling	Elston avenue	Milwaukee ave	North avenue	85 176 53
3224	Paving	Ashland avenue.	W 22nd street	So Br (Chicago R	4,078 13
3231	Graveling	W. Fourteenth st.	Centre avenue	Ashland avenue	3,562 67
3238	Graveling and filling	Wesson street	Chicago avenue	Oak street	1,415 20
3241	Filling	Elaho street	West Polk street	100 ft N of W Taylor st.	244 08
3242	"	Floumoy street	Western avenue.	Campbell avenue	268 95
3243	"	Oakley avenue	250 ft N of W Polk	West Taylor st	260 79
3244	"	West Adams st	Oakley avenue	Western avenue...	306 33
3245	"	Ballou street	West Twelfth st	Kansas street...	120 22
3247	"	Deering street	Thirtieth street	Lyman street	324 01
3250	"	Mary street	Archer avenue	C. A. & St L. R R.	205 86
3257	"	Joseph street,	Archer avenue	" " "	170 90
Total					\$16,169 67

STATEMENT OF ASSESSMENTS FOR STREET OPENINGS AND  
WIDENINGS.

No. of War- rant.	Nature of Improvement	Name of Street	From	To	Amount of Assessm't.
3121	Opening & widening	W. Washington st	Line at 2 Wakeman s	Homan avenue	\$27,572 43
3122	Opening	Catalpa avenue	North terminalus	Eighteenth street	16,634 94
3146	"	Johnson place	"	Fills Park	96 9 90
3290	"	Lybgen avenue	Through to	West Taylor st	3 831 17
3292	"	So. Dearborn st	Twenty sixth st	Spring street	7,251 19
3293	Widening	Clarkson street.	Oakley avenue	Western avenue.	4,278 80
3295	Opening	White street	Through to	Bremer street...	1,981 36
Total					\$64,309 45

## STATEMENT OF ASSESSMENTS FOR ALLEY OPENINGS.

No. of War- rant	Nature of Improvement	Amount of Assessm't
3201	Opening	Alley through block 1, Ashland Second Addition ...
3204	"	Alley in E 1/2 block 38, W 1/2 and W 1/2 of N E 1/4 Sec. 17
3205	"	Alley through block 32 School Section Addition
3206	"	Alley through lot 8, block 1, Sheffield's Addition. ....
Total		\$0,121 21

STATEMENT OF ASSESSMENTS FOR THE ERECTION OF  
LAMP POSTS.

No. of Warr- rant	No. of posts	NAME OF STREET	FROM.	TO	Amount of Assessment
3115	6	Harrison street ..	Fifth ave ..	Harrison st. bridge	117 60
3116	8	W. Harrison st ..	Canal st ..	Harrison st. bridge	176 40
3119	7	Webster ave ..	Fremont st ..	Sheffield ave ..	212 45
3120	8	N. Halsted st ..	North ave ..	Willow street ..	235 20
3124	1	Douglas ave ..	Arc eastern terminus		32 40
3126	4	Ross st ..	W. Indiana st ..	W. Ohio st ..	120 10
3127	6	W. Superior st ..	Paulina st ..	Wood st ..	178 40
3128	4	Robey st ..	W. Madison st ..	W. Lake st ..	120 10
3129	4	Hoyne ave ..	W. Madison st ..	W. Lake st ..	120 10
3130	3	Thirtieth st ..	Westworth ave ..	So. LaSalle st ..	87 20
3131	7	Forest ave ..	Thirty-seventh st ..	Thirty-eighth st ..	205 80
3132	1	Douglas ave ..	State st ..	So. Dearborn st ..	32 40
3133	1	Oak ry ave ..	W. Monroe st ..	W. Jackson st ..	264 60
3134	4	Fiftieth st ..	State st ..	So. Dearborn st ..	112 10
3144	10	Wells st ave ..	Shelburn ave ..	Lacine road ..	367 08
3145	11	Milwaukee ave ..	North ave ..	Western ave ..	949 60
3171	6	Edge S. Park bou-	levard Douglas ave	900 feet south	165 03
3189	2	Kings st ..	Kingsbury st ..	N. br. Chicago river	70 21
3229	4	Western ave ..	W. Madison st ..	Wilcox st ..	131 85
3232	8	W. Madison st ..	Canal st ..	Union st ..	291 64
3233	6	Milwaukee ave ..	W. Lake st ..	Fulton st ..	105 70
3234	4	Thirty-fourth st ..	Wabash ave ..	Indiana ave ..	123 84
3235	3	Sixty-ninth st ..	State st ..	Dearborn st ..	96 04
3236	6	Oak st ..	Larrabee st ..	Townsend st ..	175 36
					4 590 01

STATEMENT OF ASSESSMENTS FOR LAYING WATER SERVICE  
PIPES.

No. of Warr- rant	NAME OF STREET	FROM	TO	Amount of Assessment
3154	Madison ave ..	Thirty-second st ..	Thirty-third st ..	457 60
3156	N. Halsted st ..	N. br. Chicago river	Fullerton ave ..	387 00
3185	W. Adams st ..	Hoyne avenue ..	Oak ry ave ..	216 78
3185	Westworth ave ..	Twenty-second st ..	Twenty-ninth st ..	215 53
3219	Halsted st ..	So. br. Chicago river	Arcles ave ..	107 33
3227	W. Madison st ..	Canal st ..	Halsted st ..	500 00
3228	Canal st ..	W. Madison st ..	W. Harrison st ..	158 03
3232	Clark st ..	Polk st ..	Twelfth st ..	831 10
				8383 57

STATEMENT OF ASSESSMENTS FOR LAYING PRIVATE DRAINS

No. of Warr- rant	NAME OF STREET	FROM	TO	Amount of Assessment
3155	Canal avenue ..	Thirty-second street	Thirty-fourth street	\$384 00
3193	North Halsted st ..	North avenue ..	Bellevue avenue ..	2,140 00
3114	Westworth avenue ..	Twenty-second street	Twenty-ninth street ..	1,385 44
Total ...				\$3,909 44



STATEMENT OF ASSESSMENTS FOR THE CONSTRUCTION OF  
SIDEWALKS.

No of Ward rout	Side of Street	NAME OF STREET	FROM	TO	Amount of Assessment
3100	B	Francisco street.	West Lake street.	Fulton street	\$ 55 68
3101	B	West Lake street.	Western avenue	Falls street	352 88
3102	B	Morgan street	West Harrison street	West Twelfth street.	291 60
3103	R	Fairfield avenue	Thirty-fourth street.	Fagan avenue	113 68
3104	B	Pharise avenue	Twenty-sixth street	Twenty-seventh st ..	33 70
3105	B	Indiana avenue	Fourteenth street	Eighteenth street	181 60
3106	B	West Lake street	Sangamon street	Ashland avenue	116 60
3107	B	West Lake street	Ashland avenue	Western avenue	304 82
3108	N	West Kanzie street	Hastings street	Western avenue	487 32
3109	B	Morgan street	West Twelfth street	West Fourteenth st	117 24
3110	B	Labon street	West Twelfth street	Meigs street	174 90
3111	B	West Polk street	Deplaines street.	Hudson street	100 62
3112	B	West Congress st	Throop street.	Leomin street	155 20
3113	R	West Adams street	Lafayette street	Leary street.	79 38
3118	E	North Wood street	West Division street	Milwaukee avenue.	25 05
3143	B	Artesian avenue	West Lake street	West Kanzie street.	122 57
3140	R	Seymour street. ...	West Lake street	Fulton street	80 70
3141	E	Pavina street	West seventeenth st	West Nineteenth st	128 95
3142	E	Union street.	Douglas avenue	2302 First south	433 30
3143	N	Thirty-seventh st..	State street	Forest avenue	146 65
3148	N	Smith street	Ashland avenue	Wood street	70 30
3143	S	Carroll avenue	Francisco street	Sarumer to street..	119 51
3150	E	Cypress street	West Taylor street	Ashland avenue	72 90
3168	N	Peterson street	North Robey street...	Bohn avenue	90 42
3169	B	Maplewood avenue	Fulton street	Its southern terminus	86 40
3170	R	Centre avenue	West Madison street	West Twenty-second	445 54
3174	S	Le Moyne street	North Robey street	Hayes avenue	20 16
3175	B	Kedzie avenue	West Lake street	Fulton street	162 88
3176	B	Holstein street	West Madison street	West Fourteenth st	635 95
3177	B	Funch street	Westworth avenue	Archer avenue	27 48
3178	N	Thirty-second st	Benson street	Union street	208 14
3179	R	North Park street	Chicago avenue	North avenue	259 60
3180	B	Leavitt street	West Madison street..	Ogden avenue	400 62
3181	B	Henry street	Blue Island avenue	Ashland avenue	228 65
3182	B	Fulton street	Sangamon street	Robey street	541 91
3183	N	West Indiana st.	Central Park avenue	Springfield avenue....	124 41
3184	W	Kedzie avenue.	Fulton street	Central Park boulevard	521 08
3189	N	West Lake street	Central Park	Crawford avenue	168 21
3188	W	Forest avenue	Douglas avenue	Thirty-seventh street	151 80
3207	B	Grove and Park av	Thirty-first street	Twenty-third street	45 50
3208	B	West Twelfth street	S. Branch Chicago r.v	Blue Island avenue	945 15
3209	B	Fairfield avenue	West Lake street	Fulton street.	112 00
3210	B	Fulton street	Clinton street.	Sangamon street	907 60
3211	B	Thirty-first street	State street	Lake Park avenue	347 61
3212	W	South Park avenue	Thirty-first street	Douglas avenue	212 61
3213	E	Lafayette street	Douglas avenue	Fagan avenue	170 45
3214	B	Indiana avenue	Twenty-ninth street	Douglas avenue	154 00
3215	S	Douglas avenue	Douglas ave bridge	Union street	618 51
3216	B	North Market st.	Schiller street.	North avenue	60 48
3217	W	St Clair street	Michigan street	Superior street	89 75
3218	E	Tunka street	West Polk street	West Taylor street	107 73
3217	B	Holstein street.	Archer avenue	Fagan avenue	224 98
3220	B	West Adams street	Cana street	Hastings street	812 48
3240	B	West Adams street	Holstein street	Lafayette street	151 14
3240	B	Maple street	State street	Fulton street	301 20
3248	E	Emerald avenue	Kossuth street	Twenty-sixth street.	8 60
3249	E	Central Park av	West Indiana street.	West Huron street	217 58
Total					\$12,568 78

## SUMMARY.

Total assessments for wooden block pavement, including curbing and filling:

North Division.....	\$27,336.14	
South Division.....	69,964.83	
West Division.....	48,569 52	
	<hr/>	\$145,870 49

Total assessments for Medina block stone pavement:

South Division.....		22,977.83
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Total assessments for miscellaneous street and alley improvements:

North Division.....	1,415.20	
South Division.....	700.77	
West Division.....	14,053.70	
	<hr/>	16,169.67

Total assessments for street openings and widenings:

North Division.....	1,081.36	
South Division.....	27,545.73	
West Division.....	35,682.36	
	<hr/>	64,309.45

Total assessments for alley openings:

North Division.....	659.94	
West Division.....	5,461.27	
	<hr/>	6,121.21

Total assessments for the erection of lamp posts:

North Division.....	1,090.71	
South Division.....	1,042.62	
West Division.....	2,456.68	
	<hr/>	4,590.01



Total assessments for laying water service pipes :		
North Division.....	3,956.60	
South Division.....	3,551.56	
West Division ..	875 41	
	<hr/>	8,383.57

Total assessments for laying private drains :		
North Division.....	2,140.60	
South Division.....	1,769.44	
	<hr/>	3,910.04

Total assessments for constructing plank sidewalks :		
North Division.....	379.83	
South Division.....	3,447.63	
West Division.....	8,740.72	12,568.18
	<hr/>	<hr/>

Total amount of assessments for North, South and West Divisions.....	\$284,900.45
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To be paid from appropriation fund in the—	
North Division.....	4,779.69
South Division.....	19,220.71
West Division.....	12,656.03
	<hr/>

Total estimated cost of all improvements in North, South and West Divisions .....	<u>\$321,556.88</u>
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Total number of lamp post provided for by assessment :	
NORTH DIVISION.	
From January 1, 1878, to January 1, 1879.....	15
Posts erected prior to January 1, 1878.	2,158
	<hr/>
	2,173

SOUTH DIVISION.

From January 1, 1878, to January 1,		
1879.....	17	
Posts erected prior to January 1, 1878.	3,093	
	<hr/>	3,110

WEST DIVISION.

From January 1, 1878, to January 1,		
1879.....	39	
Posts erected prior to January 1, 1878.	5,368	
	<hr/>	5,407
Total number of posts in the city pro-		
vided for by special assessment....		10,690
In addition to the above, there are bridge		
and viaduct lamp posts, not pro-		
vided for by special assessment,		
which makes the total number of		
lamp posts in the city.....		10,782

SUMMARY.

The improvements made during the past year, in addition to those previously reported, gives the following

RECAPITULATION.

577,635 lineal feet of wooden block pavement,	
equal to.....	109 <sup>2115</sup> / <sub>5280</sub> miles
3,271 lineal feet of stone pavement, equal to.....	3 <sup>271</sup> / <sub>5280</sub> miles
46,207 lineal feet of cindering, equal to.....	8 <sup>967</sup> / <sub>5280</sub> miles
43,034 lineal feet of graveling, equal to.....	8 <sup>794</sup> / <sub>5280</sub> miles
31,057 lineal feet of macadamizing, equal to.....	5 <sup>457</sup> / <sub>5280</sub> miles
Total number of miles improved in the city..	<u>132<sup>4244</sup>/<sub>5280</sub> miles</u>

These improvements are distributed in the three divisions of the city as follows :

## NORTH DIVISION.

130,265 lineal feet of wooden block pavement, equal to.....	24 $\frac{8545}{5240}$ miles
908 lineal feet of stone pavement, equal to.....	$\frac{908}{5240}$ miles
6,666 lineal feet of cindering, equal to.....	1 $\frac{1389}{5240}$ miles
1,604 lineal feet of graveling, equal to.....	$\frac{1604}{5240}$ miles
3,049 lineal feet of macadamizing, equal to.....	$\frac{3049}{5240}$ miles

Total number of miles improved in the North

Division .....	26 $\frac{5212}{5240}$ miles
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## SOUTH DIVISION.

195,133 lineal feet of wooden block pavement, equal to.....	36 $\frac{6068}{5240}$ miles
2,363 lineal feet of stone pavement, equal to.....	$\frac{2363}{5240}$ miles
27,510 lineal feet of graveling, equal to.....	5 $\frac{1110}{5240}$ miles
1,839 lineal feet of macadamizing, equal to.....	$\frac{1839}{5240}$ miles

Total number of miles improved in the South

Division .....	42 $\frac{9056}{5240}$ miles
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## WEST DIVISION.

252,237 lineal feet of wooden block pavement, equal to.....	47 $\frac{4077}{5240}$ miles
39,541 lineal feet of cindering, equal to.....	7 $\frac{251}{5240}$ miles
13,920 lineal feet of graveling, equal to.....	2 $\frac{386}{5240}$ miles
26,169 lineal feet of macadamizing, equal to.....	4 $\frac{649}{5240}$ miles

Total number of miles improved in the West

Division.....	62 $\frac{4607}{5240}$ miles
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The following is a list showing the total of assessments made in each year since 1861 :

For the year ending April 1, 1862.....	\$42,635 49
For the year ending April 1, 1863.....	46,493.67

For the year ending April 1, 1864. . . . .	389,169.31
For the year ending April 1, 1865. . . . .	103,576.35
For the year ending April 1, 1866. . . . .	802,574.56
For the year ending April 1, 1867. . . . .	317,206.18
For the year ending April 1, 1868. . . . .	1,354,436 48
For the year ending April 1, 1869. . . . .	2,395,683.03
For the year ending April 1, 1870. . . . .	2,836,852.48
For the year ending April 1, 1871. . . . .	2,359,835.89
For the year ending April 1, 1872. . . . .	62,222.25
For the year ending April 1, 1873. . . . .	.....
For the year ending April 1, 1874. . . . .	749,460.27
For the year ending April 1, 1875. . . . .	723,254.42
For the nine months ending January 1, 1876. . . . .	60,585.72
For the year ending January 1, 1877. . . . .	1,516,081.07
For the year ending January 1, 1878. . . . .	124,498 48
For the year ending January 1, 1879. . . . .	284,900.45
Total for eighteen years. . . . .	<u>\$14,169,467.10</u>

### SIDEWALKS.

During the past year, the following sidewalks have been constructed :

Concrete. . . . .	570 lineal feet.
Stone. . . . .	5,352 " "
Plank. . . . .	36,684 " "
Total. . . . .	<u>42,606 " "</u>
Or $8\frac{366}{5280}$ miles.	

This, in addition to walks heretofore built, makes a total of  $712\frac{23}{5280}$  miles in the city.

The following table embraces the various assessments, with the estimated cost of the same, made during your administration.

Taking into consideration the fact that during that period but four clerks have been employed in place of ten, as formerly, I am sure the comparison with the work of former years will be as pleasing to you, as it is gratifying to me.

Statement of assessments made during the three years ending January 1, 1879:

	NORTH DIVISION.	SOUTH DIVISION.	WEST DIVISION	TOTAL.
Wooden block pavement, including curbing and filling.....	\$82,666.15	\$165 666.52	\$164,596.81	\$412,929.43
Stone pavement.....	.....	27,328.76	.....	27,328.76
Miscellaneous street and alley improvements. ....	63,742.68	727.24	64,941 08	129,411.00
Street openings and widenings.....	3,669.57	1,197,674.31	206,836.07	1,414,179.95
Alley openings and widenings.....	1,328.15	3,196.36	8,336 73	12,861 24
Private drains.....	7,723.05	2,134.00	816 00	10,673.05
Water service pipes.....	6,077.50	8,048.92	1,807.01	15,933.43
Lamp posts.....	2,565.86	4,199.12	11,070.93	17,835.91
Plank sidewalks.....	1,101.00	7,514.42	16,916.48	25,531.90
Totals.....	\$174,874 05	\$1,416,489.65	\$475,321.11	\$2,066,684.81

Respectfully submitted,

H. J. JONES,

*In charge of Special Assessments.*

## FINANCIAL STATEMENT.

TO HON. MONROE HEATH, *Mayor,**And in charge of the Dept. of Public Works.*

DEAR SIR:—I herewith respectfully submit my report of the receipts and expenditures of the Department of Public Works, from January 1st, 1878, to December 31st, 1878, inclusive:

TRIAL BALANCE LEDGER, DEPARTMENT OF  
PUBLIC WORKS, DECEMBER 31, 1878.

	DR.	CR.
Water Works.....	\$6,135,679 52	
"    "    Income.....		\$9,412,164 61
Water Fund in hands of City Treasurer.....	245,576 76	
General Taxes, 1874 and 1875..		430,000 00
Water Loan Bonds 6 per cent..		622,000 00
"    "    "    7 per cent...		3,625,000 00
"    "    "    Canceled....		568,000 00
Water Loan Interest.....	3,750,694 34	
Water Works, expense and re- pairs .....	4,353,078 40	
Duncan, Sherman & Co.....	16,065 00	
Water Works Stock.....	29,318 00	
American Exchange Nat'l Bank.	126,352 59	
E. M. Johnson.. ..	500 00	
G. W. Williams.....		100 00
Water Tax Fund in hands of City Treasurer.....	93,573 48	
Ogden, Sheldon & Co.....		2,767 43
Burnett, Todd & Cochran.....		250 00
Amount carried forward.....	\$14,750,838 09	\$14,660,282 04

## THE DEPARTMENT OF PUBLIC WORKS.

141

	Dr.	Cr.
Amount brought forward.....	\$14,750,838 09	\$14,660,282 04
John Tyrrell.....		150 00
Wm. Graydon.....		250 00
S. J. Bushnell.....		250 00
I. R. Hitt.....		25 00
A. P. Downs & Co.....		50 00
D. R. Dyche.....		50 00
J. B. Drake.....		150 00
J. A. Hamilton and E. N. Taylor		3,542 72
W. Little.....		100 00
Rathborn, Sard & Co.....		300 00
Fuller, Warren & Co.....		250 00
C. J. L. Meyer.....		200 00
E. H. Castle.....		150 00
Peshtigo Co.....		300 00
Sydney Myers.....		250 00
Chicago Canal and Dock Co....		1,166 43
Henry Fuller.....		200 00
Sidney Myers ..		1,063 77
Water Works.....	2,295,343 88	
General Taxes, Water.....		2,377,452 01
Sewerage Fund in hands of City		
Treasurer.....	468,906 38	
Sewerage Sinking Fund.....		55,111 05
Sewerage Sinking Fund in hands		
of City Treasurer.....	41,857 66	
Sewerage Loan Interest.....		136,296 06
American Exchange Nat'l Bank.	900 03	
Certificates of Indebtedness....		356,728 00
Stock account.....	1,932 50	
Rebates on sewerage taxes.....	40,950 90	
Galena & Chicago Union R.R.Co.		382 55
Chicago, Burlington & Quincy R.		
R. Co.....		6,744 01
House drains.....	714 20	
Sewerage tax fund in hands of		
City Treasurer.....	534,936 41	
Amount carried forward.....	\$18,136,380 05	\$17,601,443 64

	DR.	CR.
Amount brought forward. ....	\$18,136,380 05	\$17,601,443 64
Sewers, North Division.....	1,026,907 93	
"    South    "    .....	1,387,669 15	
"    West    "    .....	2,573,765 08	
Sewerage advances.....	38,522 53	
Sewerage loan bonds, 6 per cent.		80,000 00
"    "    "    7 per cent.		2,543,000 00
"    "    "    cancelled..		377,000 00
Certificates of indebtedness.....		98,243 87
Sewerage covers.....	5,353 63	
"    pipe.....	13,273 15	
"    brick.....	3,189 77	
"    cement.....		1,470 79
General taxes, sewerage.....		2,441,632,76
S. Lind, treasurer, sewerage commissioners .....	109,245 48	
D. Coughlin.....	1,561 51	
B. McMahon.....		200 00
O. B. Heaton.....		428 75
E. N. Taylor & J. A. Hamilton.		15,596 77
A. Jacobson & P. Tallman.....		2,000 00
A. Jacobson.....		2,000 00
C. A. Gregory.....		4,000 00
R. DeBaptiste.....		15 00
F. Kneeland.....		31 25
H. Greenebaum, Treasurer.....		4,500 00
A. A. Dewey.....		235 00
C. B. Farwell.....		265 30
J. E. Aweley.....		264 00
C. W. Rigdon.....		1,732 50
G. E. Adams.....		205 63
E. S. Dreyer.....		530 56
S. W. Rawson.....		30 00
J. A. Blomgreen.....		133 25
J. M. Johnson.....		133 25
Z. Rosenlof.....		133 25
L. Wrick.....		133 25
Amount carried forward.....	\$23,295,868 28	\$23,175,358 82



## THE DEPARTMENT OF PUBLIC WORKS.

143

	Dr.	Dr.
Amount brought forward.....	\$23,295,868 28	\$23,175,358 82
J. O'Callaghan.....		627 70
Chicago, Milwaukee & St. Paul		
R. R.....		700 10
N. C. City R. R. Co.....		4,656 97
P. D. Bitticher.....	347 76	
T. Scanlon.....		92 11
M. Clarkson.....		36 92
M. Hallinan.....		20 53
M. McNichols.....		146 02
Ward 14.....		28,128 49
" 8.....		667 00
" 13.....		6,305 31
" 7.....		3,587 33
" 11.....		5,283 35
" 18.....		133 12
" 4.....		15,130 67
" 16.....		3,826 74
" 17.....		69 67
" 3.....		4,943 86
" 12.....		17,096 22
Ward 6.....		6,590.38
Ward 15.....		6,210 73
Ward 1.....		64.24
Ward 9.....		58.77
Ward 10.....		145.42
Ward 5.....		9615.94
Miscellaneous Sewerage expense	94.00	
Interest on Temporary Loans...		6,813.63
Appropriation Fund in hands of		
Treasurer .....	725,303.52	
North Division.....		14,540.07
South Division.....		15,219.97
West Division.....		22,037.06
Special Assessment Expense ...		2,164.31
Office expense.....		3,564.85
Public Buildings.....		6,939.43
Amount carried forward.....	\$24,021,613 56	\$23,360,775 73

	Dr.	Dr.
Amount brought forward.....	\$24,021,613 56	\$23,360,775 73
Sidewalks North Division.....		1,268 94
"        South        "        .....		2,349.53
"        West        "        .....		3,799.46
Union Square .....		645 00
Washington Park.....		91.70
Ellis Park.....		258.68
Dearborn Park.....		500.00
Lake Park.....		2,633.19
Union Park.....		240.80
Jefferson Park.....		107.72
Vernon Park.....		135 50
Wicker Park.....		132 88
Washington Street Tunnel.....		2,814 59
La Salle Street Tunnel.....		586.13
Public Hydrants.....		183 66
F. J. Reed, Cashier.....	308 12	
Warrant No. 480.....		308 12
Proportional Expense Salary ac count.....		793 39
Public Benefits.....		83,546 25
Chicago Harbor.....		17,159 87
Bridge Tender's Salaries.....		5,682 90
Bridge Department.....		4,666 48
Fullerton Avenue Bridge.....		1,545 00
North Avenue Bridge.....		14,133 78
Thirty-ninth Street Bridge.....		1,426 66
Permits .....		1,722 17
Eighteenth street viaduct.....		7,803 44
Indiana street viaduct.....		2,468 00
Milwaukee avenue viaduct.....		3,263 98
Blue Island avenue viaduct.....		503 67
Sangamon street viaduct.....		15,463 00
Fullerton avenue conduit.....		75,594 52
Certificates of indebtedness.....		216,414 95
Interest on certificate of indebted- ness .....	127,033 53	
Amount carried forward.....	\$24,148,955 21	\$23,829,019 69

	Dr.	Cr.
Amount brought forward.....	\$24,148,955 21	\$23,829,019 69
House numbers.....	2 08	
Ogden ditch dam.....		965 00
Surplus fund.....		320,044 34
Street lamps.....	1,071 74	
City Hall fund.....	129,789 09	
McKenney & Doyle.....	3,600 00	
City Hall appropriation.....		311,481 24
City Hall miscellaneous expense.	13,189 03	
John Sackley.....	1,483 62	
Mortimer & Tapper.....	58,194 88	
P. J. Sexton.....	25,553 67	
John Angus.....	18,355 69	
Thomlinson & Reed.. ..	61,315 26	
River improvement fund.....		88,690 00
American Exchange Nat'l Bank.	90,031 20	
River improvement loan, interest		35,023 11
River improvement sinking fund.		41,272 00
River improvement sinking fund in hands of Treasurer.....	41,272 00	
River improvement bonds, 7 per cent.....		2,611,000 00
River improvement bonds can- celed .....		389,000 00
River improvement certificate of indebtedness.....		272,976 98
Cost of deepening Illinois and Michigan Canal.....	3,306,658 89	
City Bridewell fund .....	4,429 07	
Cost of City Bridewell.....	380,570 93	
City Bridewell bonds.....		385,000 00
	<hr/>	<hr/>
	\$28,284.472 36	\$28,284,472 36

WATER FUND.

STATEMENT of the receipts by the Department of Public Works, and detailed statement of expenditures from January 1st, 1878 to December 31st, 1878, inclusive.

RECEIPTS.

Received from Water Tax collected.....	944,190 97	
Received from sale of 100 water bonds .....	102,300 00	
Received from tapping pipes...	4,988 25	
"    "    letting on water.	2,839 87	
"    "    setting meters..	5,554 08	
"    "    labor & material	11,012 75	
"    "    sale of 2 drills...	600 00	
"    "    sale of 2 barrels.	11 00	
Received from labor refunded		
West Pumping Works.....	67 50	
Received from rent Chicago ave. lot.....	41 16	
Total receipts.....		\$1,071,605 58

EXPENDITURES.

ADDITION TO WATER WORKS.

DISTRIBUTING PIPES AND SUPPLY MAINS LAID.	Cash Payments.	True Cost.
For cast iron water pipe	\$24,940 36	
Labor laying pipe.....	20,213 74	
Paid advances for laying		
pipe.....	16,367 83	
Special castings.....	5,178 16	
Cement.....	2,022 90	
Brick.....	1,566 40	
Amount carried forward.	\$70,289 39	

	Cash Payments.	True Cost.
Amount brought forward	\$70,289 39	
Lead .....	1,872 82	
Sewer pipe.....	255 78	
Hardware .....	184 62	
Rebates on money ad- vanced to lay pipe....	623 05	
Lumber.....	485 20	
Keeping horses.....	240 59	
Sand .....	243 75	
Plumbing .....	250 10	
Oil.....	37 13	
Gasket .....	42 53	
Repairing wagon .....	46 75	
Harness and repairs....	80 87	
Rent of stable.....	48 00	
Lanterns.....	12 87	
Royalty on hydrants...	7 50	
Oil cans.....	9 85	
	<hr/>	
	\$74,730 80	
ADD—		
For laying pipe for which money was advanced.	\$100 00	
For making hydrants and stop cocks at shops in 1878.....	13,799 72	
	<hr/>	
	\$13,899 72	
DEDUCT—		
Amount received for la- bor and material.....	11,012 75	
	<hr/>	
	\$2,886 97	
	<hr/>	
		\$77,617 77
<hr/>		
Total additions to water works.....	\$74,730 80	\$77,617 77

## WORKING EXPENSES AND REPAIRS.

Cash Payments      True Cost

NORTH PUMPING WORKS  
AND SHOPS

For Coal paid for. . . . .	\$42,973 29		
Labor . . . . .	30,657 83		
Castings . . . . .	6,555 41		
Packing and Gasket. . . .	549 85		
Oil and Paint. . . . .	795 15		
Iron and Steel. . . . .	473 81		
Repairing Pine street. . .	656 22		
Gas paid for. . . . .	524 70		
Steam fitting. . . . .	127 99		
Lead. . . . .	258 27		
Repairing boilers. . . . .	211 81		
Hardware. . . . .	202 72		
Lumber. . . . .	130 85		
Horse Feed . . . . .	723 59		
Two gauges. . . . .	171 00		
Telegraph material. . . .	69 45		
Compound. . . . .	13 20		
Horse shoeing. . . . .	48 65		
Soap. . . . .	17 60		
Waste . . . . .	93 17		
Repairing harnesses. . . .	22 65		
Rubber boots. . . . .	21 25		
Handling ashes. . . . .	36 25		
Tallow. . . . .	13 60		
Brooms . . . . .	16 00		
Hose . . . . .	59 00		
Ice . . . . .	22 25		
Chain . . . . .	18 40	\$85,463 96	
Amount carried forward.		\$85,463 96	

		Cash Payments.	True Cost.
Amount brought forward		\$85,463 96	
DEDUCT—			
For coal used previously paid for.....	\$584 89		
For labor at shops in making hydrants, &c..	13,799 72		
For labor at shops for inlet basin.....	441 99		
For labor at shops for meters.....	306 23		
For labor at shops for West Pumping Works	103 86		
For labor at shops for Lake Crib.....	115 90		
For labor at shops for repairing tools.....	552 48		
For keeping tappers, horses and labor.....	762 56		
	<u>\$16,667 63</u>		\$68,796 33

## WEST PUMPING WORKS.

Coal paid for .....	\$26,881 42		
Labor .....	20,962 74		
Oil .....	1,861 21		
Valves .....	795 73		
Brick .....	486 90		
Iron work .....	568 52		
Gasket and packing....	362 33		
Steam fitting.....	217 52		
Lumber .....	246 91		
Castings .....	452 40		
Cement.....	102 80		
Tile .....	130 76		
Planking Ashland ave..	452 27		
Grate bars.....	224 72		
Amount carried forward	<u>\$53,746 23</u>	<u>\$85,463 96</u>	<u>\$68,796 33</u>

		Cash Payments.	True Cost.
Amount brought forward	\$53,746 23	\$85,463 96	\$68,796 33
Waste.....	108 56		
Repairing boilers .....	202 97		
Compound .....	83 15		
Matches .....	4 50		
Lead .....	9 42		
Drinking fountain.....	64 00		
Vitriol.....	6 75		
Plumbing .....	54 00		
Ice .....	36 28		
Soap .....	44 75		
Sand .....	45 00		
Files .....	49 21		
Repairing Blocks.....	27 55		
Hardware .....	89 12		
Brooms and brushes....	40 00		
Tallow .....	22 60		
Stone .....	18 00		
Reglazing .....	17 00		
Barrows.....	36 00		
	<hr/>		
		54,705 09.	
ADD—			
For labor at shops in 1878 .....	103 86		
DEDUCT—			
Amount received for two drills.....	\$600 00		
Amount received for la- bor .....	\$78 50		
	<hr/>		
	\$574 64		
	<hr/>		
Amount carried forward.		\$140,169 05	\$122,926 78



	Cash Payments.	True Cost.
Amount brought forward	\$140,169 05	\$122,926 78

WATER OFFICE EXPENSE AND SAL-  
ARIES.

One-third salary of city engineer.....	\$1,166 66
One-third salary of secretary.....	666 66
One-third salary of superintendent.....	800 00
One-third salary of book-keeper.....	733 33
One-third salary of ass't book-keeper .....	466 66
One-third salary of engineer's clerk.....	400 00
One-third salary of superintendent's clerk..	466 67
Salary of chief clerk water office.....	1,800 00
Salary of cashier water office .....	1,600 00
Salary of four division clerks water office....	4,800 00
Salary of five ass't division clerks water office.	4,500 00
Salary of water collectors.....	14,500 00
Salary of water assessor	1,600 00
Salary of ass't water assessor .....	1,200 00
Salary of draughtsman..	1,000 00
Salary of permit clerk..	1,000 00
Salary of meter clerk...	1,200 00
Labor, water inspectors and shut off men.....	6,226 02

Amount carried forward	\$44,126 00	\$140,169 05	\$122,926 78
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Amount brought forward	\$44,126 00	\$140,169 05	\$122,926 78
Printing.....	949 86		
Stationery .....	457 50		
Advertising .....	503 98		
One-third printing second annual report.....	200 00		
Engraving second annual report .....	121 16		
Water rate books.....	136 75		
Cash items paid by cashier .....	438 88		
Water register.....	50 00		
Directories .....	25 00		
Water gauge.....	18 00		
Matting .....	15 30		
Telegraph material .....	12 77		
Badges .....	40 50		
Tapes .....	28 25		
Hardware.....	29 41		
Soap .....	5 00		
Brooms .....	3 50		
	<hr/>	\$47,161 86	\$47,161 86

## WATER METERS.

New meters put in use..	\$7,022 41		
Labor.....	6,797 50		
Castings.....	3,176 59		
Lumber.....	1,232 32		
Freight on meters.....	231 59		
Saw dust .....	101 75		
Two horses.....	225 00		
Valves .....	131 95		
Hardware.....	111 38		
Packing .....	26 17		
Plumbing .....	89 27		
Horse shoeing.....	35 33		
Candles .....	46 75		
Horse feed.....	63 10		
	<hr/>	<hr/>	<hr/>
Amount carried forward	\$19,291 11	\$187,330 91	\$170,088 64

		Cash Payments.	True Cost.
Amount brought forward	\$19,291 11	\$187,330 91	\$170,088 64
Roofing walk.....	25 60		
New harnesses .....	88 50		
Repairing wagon .....	55 40		
Tapes.....	8 00		
Matches .....	7 75		
Nails .....	7 00		

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19 483 36.

ADD—

Labor at shops ..... 306 23

DEDUCT—

Amount received for la-  
bor and material..... 5,554 08

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\$5,247 85

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\$14,235 51

REPAIRS OF PIPES HY-  
DRANTS, STOPS, AND MIS-  
CELLANEOUS OPERATING  
EXPENSES.

For 255 \$1,000 Water

Loan Bonds purchased

and cancelled.....\$258,313 34

Labor..... 32,141 07

Cement ..... 343 55

Hose ..... 220 00

Plumbing ..... 107 48

Horse feed..... 119 10

Lead ..... 220 50

Brick ..... 439 33

Engine for Electric light 360 75

Lumber ..... 97 97

Gauges.. ..... 51 50

Nails and Hardware.... 69 00

Repairing wagons..... 70 55

Saw dust..... 50 00

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Amount carried forward \$292,604 14 \$206,814 27 \$184,324 15

		Cash Payments.	True Cost.
Amount brought forward	\$292,604 14	\$206,814 27	\$184,324 15
Lanterns and repairs...	34 65		
Candles .....	9 00		
One pump.....	16 00		
Horse shoeing.....	27 75		
Sand .....	26 25		
Steam fitting.....	21 68		
Rubber boots.....	11 75		
Brooms and Pails.....	4 16		

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292,755 38.

## ADD—

For 52 Bonds purchased and retired of the 152 issued in January.....	52,000 00
For labor at shop in 1878.....	552 48
	<hr/> 52,552 48

## DEDUCT—

Amount rece'vd for shut- ting off water.....	2,881 03
	<hr/> \$49,671 45

342,426 83

## WATER SERVICE COCKS.

Labor of tappers.....	4,737 88
Salary of Permit clerk...	1,000 00
Corporation taps.....	1,357 97
Tapping boxes .....	158 75
Harnesses and repairs ..	70 60
Sponges .....	5 55
Matches.....	14 00
Repairing wagon.....	7 80
Hardware.....	37 10
Horse shoeing.....	92 50
Lumber .....	16 76
Wagon Covers.....	32 15

Amount carried forward	\$7,531 06	\$499,569 65	\$526,750 98
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		Cash Payments.	True Cost.
Amount brought forward	\$7,531 06	\$499,569 65	\$526,750 98
Hose.....	15 30		
Blankets .....	10 00		
	<hr/>	\$7,556 36.	

## ADD—

For overdraft in 1877...	\$3,793 69
Labor at shops in 1878.	762 56
	<hr/>
	\$12,112 61

## DEDUCT—

Amount received for tapping pipes.....	4,988 25	\$7,124 36
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## LAKE TUNNEL CRIB.

Salary of crib keeper...	\$900 00
Labor repairing crib...	3,554 04
Paid for diving.....	4,257 50
Iron work.....	643 65
Groceries and beef.....	572 31
Use of scow.....	307 95
Use of tug.....	1,045 91
Steel plates .....	490 80
Steam fitting .....	464 05
Coal .....	223 89
Hardware .....	130 93
Oil.....	117 14
Castings .. ..	65 66
Stove.....	15 00
Rope.....	73 07
Loading boiler .....	10 00
Toweling .....	1 75
Packing .....	15 38
Boots .....	10 00
Use of pump.....	50 00
Lumber .....	80 49

Amount carried forward	\$13,029 52	\$507,126 01	\$533,875 34
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		Cash Payments.	True Cost.
Amount brought forward	\$13,029 52	\$507,126 01	\$533,875 34
Lamps .....	15 40		
Repairing boat.....	17 50		
Wire baskets.....	30 50		
Cement .....	11 25		
	<hr/>	\$13,104 17	

ADD—

For labor at shops in 1878 .....	\$115 90	13,220 07
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## INLET BASIN.

Labor.....	7,339 85	
Lumber .....	1,328 42	
Use of pump.....	579 50	
Pile driver.....	242 00	
Hardware .....	172 89	
Piles.....	379 50	
Bolts .....	111 60	
Stone .....	433 50	
Steam fitting.....	33 83	
Rope.....	18 54	
Chain .....	13 86	
Brick .....	85 60	
Cement .....	87 75	
Nails.....	19 50	
Telegraph material.....	38 48	
	<hr/>	\$10,884 82

ADD—

For labor at shops in 1878	\$441 99	\$11,326 '81
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## HYDRANTS.

Labor .....	\$13,881 51	
Lumber.....	1,766 36	
Brick.....	682 66	
Cement.....	441 10	
Sewer pipe.....	312 12	
	<hr/>	
Amount carried forward,	\$17,083 75	\$531,115 00
		\$558,422 22

		Cash Payments.	True Cost
Amount brought forward	\$17,083 75	\$531,115 00	\$558,422 22
Hardware .....	236 00		
Saw dust.....	142 50		
Lead .....	190 52		
Oil.....	84 37		
Rope.....	11 55		
Horse feed .....	73 00		
Sand .....	67 50		
Horse shoeing.....	13 70		
Steam fitting.....	7 13		
Lanterns and repairs...	10 75		
Felting .....	79 97		
Repairing wagons.....	64 16		
	<hr/>	\$18,064 90	\$18,064 90
Total operating expenses		\$549,179 90	\$576,487 12

## WATER LOAN INTEREST.

		Cash Payments.	True Cost
Remittances to American Exchange National bank to pay July, 1878, interest.....	\$117,695 84		
Remittances to American Exchange National Bank to pay January, 1878, interest.....	123 342 59		
Coupons paid by City Treasurer .....	64,510 12		
Exchange.....	88 65		
Premium and interest on bonds purchased.....	12,648 05		
	<hr/>	\$318,285 25	
DEDUCT—			
Amount received for interest.....	\$2,300 00		\$315,985 25

## RECAPITULATION.

	Cash Payments.	True Cost.
Total additions brought forward, . . . .	\$74,730 80	\$77,617 77
Total operating expenses brought forward . . . . .	549,179 90	576,487 12
Total interest brought forward . . . .	318,285 25	315,985 25
Total expenditures . . . . .	<u>\$942,195 95</u>	<u>\$970,090 14</u>

## SEWERAGE FUND.

Statement of Receipts by the Department of Public Works and detailed statement of Expenditures from January 1st, 1878, to December 31st, 1878, inclusive.

## RECEIPTS.

Amount of appropriation by Common Council . . . . .	\$474,883 31	
Amount received from house drain permits . . . . .	8,315 43	
Amount received for cleaning sewer . . . . .	83 62	
Total receipts . . . . .		\$483,282 36

## EXPENDITURES.

## SEWERAGE OFFICE EXPENSE AND SALARIES.

	Cash Payments.	True Cost.
$\frac{1}{3}$ salary of City Engineer	\$1,166 64	
$\frac{1}{3}$ salary of Secretary . . .	666 64	
$\frac{1}{3}$ salary of Superintend't	800 00	
$\frac{1}{3}$ salary of Book-keeper.	733 32	
$\frac{1}{3}$ salary of Ass't " .	533 32	
Amount carried forward	<u>\$3,899 92</u>	



		Cash Payments.	True Cost.
Amount brought forward	\$3,899 92		
½ salary of Draughtsman	375 00		
Printing .....	606 64		
Stationery .....	199 42		
Advertising .....	366 77		
Sundry cash items paid by cashier.....	407 99		
Printing second annual report .....	200 00		
Engraving second annual report .....	106 67		
Soap .....	5 00		
Oil .....	1 70		
	<hr/>	\$6,169 11	\$6,169 11

## STREET INTERSECTIONS.

Labor .....	\$5,212 98		
Cement .....	919 90		
Covers used.....	2,010 00		
Brick used.....	1,224 00		
Lumber used.....	342 80		
Sand used.....	18 75		
Labor transferred from sewerage tax fund....	230 00		
Pipe used.....	45 32		
	<hr/>	\$10,003 75	

## ADD—

For depreciation in tools 44 94

## DEDUCT—

For labor charged repairs

West Division..... 481 17.

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\$436 23

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\$9,567 52

Amount carried forward

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\$16,172 86

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\$15,736 63

	Cash Payments.	True Cost.
Amount brought forward	\$16,172 86	\$15,736 63
HOUSE DRAINS.		
Labor .....	\$5,568 48	
Pipe junctions used.....	8,518 41	
Draughtsman.....	1,375 00	
Engineers.....	950 00	
Horse keeping.....	65 52	
	<hr/>	
	\$16,477 41	
DEDUCT—		
Amount received for permits .....	\$8,315 43	8,161 98
STOCK ACCOUNT.		
Tools and hardware....	\$222 28	
Repairing tools.....	179 68	
Hose.....	90 00	
Felting .....	42 03	
Rubber boots.....	31 50	
Oakum .....	5 00	
	<hr/>	
	\$570 49	
DEDUCT—		
Amount received for depreciation in tools....	\$270 43	\$300 06
REPAIRS SEWERS NORTH DIVISION.		
Labor.....	\$794 49	
Covers used.....	309 00	
Sand used.....	40 00	
Brick used.....	49 60	
Cement used .....	16 25	
Pipe used .....	46 24	
	<hr/>	
	\$1,255 58	
ADD—		
For depreciation in tools.	\$7 43	\$1,263 01
	<hr/>	<hr/>
Amount carried forward.	\$34,476 34	\$25,461 68

	Cash Payments.	True Cost
Amount brought forward	\$34,476 34	\$25,461 68

REPAIRS SEWERS SOUTH  
DIVISION.

Labor .....	\$1,616 37	
Covers used.....	678 00	
Brick used.....	222 18	
Sand used.....	46 90	
Cement used.....	45 82	
Pipe used.....	67 82	
	<hr/>	
	\$2,677 09	
ADD—		
For depreciation in tools.	\$14 30	\$2,691 39

REPAIRS SEWERS WEST  
DIVISION.

Labor .....	\$3,776 34	
Covers used.....	649 00	
Pipe used.....	76 94	
Sand used.....	65 70	
Oil used.....	42 82	
Brick used.....	348 44	
Cement used.....	211 25	
Lumber used.....	35 20	
Coal used.....	4 38	
Rubber boots.....	13 00	
	<hr/>	
	\$5,223 07	
ADD—		
For labor charged street intersections.....	481 17	
For depreciation in tools.	33 33	
	<hr/>	
	\$514 50	\$5,737 57

CLEANING SEWERS NORTH  
DIVISION.

Labor .....	\$5,559 93	
	<hr/>	
Amount carried forward	\$47,936 43	\$33,890 64

		Cash Payments.	True Cost.
Amount brought forward		\$47,936 43	\$33,890 64
ADD—			
For depreciation in tools.	\$35 00		\$5,594 93
CLEANING SEWERS			
SOUTH DIVISION.			
Labor .....		\$9,266 67	
ADD—			
For depreciation in tools.	\$50 00		
DEDUCT—			
Amount received for			
labor. ....	83 62		
	<hr/>		
	\$33 62		9,233 05
CLEANING SEWERS			
WEST DIVISION.			
Labor .....		\$10,790 96	
ADD—			
For depreciation in tools.	\$85 43		10,876 39
SEWERAGE SINKING			
FUND.			
Paid Sewerage Sinking			
Fund in hands of City			
Treasurer its portion			
of Sewerage Tax for			
1878 .....	\$500 00		
Paid River Improvement			
Sinking Fund in hands			
of City Treasurer its			
portion of Sewerage			
Tax for 1878 .....	500 00		
	<hr/>		
		1,000 00	1,000 00
Amount carried forward		\$68,994 06	\$60,595 01

	Cash Payments.	True Cost.
Amount brought forward	\$68,994 06	\$60,595 01
SEWERAGE LOAN		
INTEREST.		
Paid Merchants' National Bank for July, 1878, interest.....	\$92,044 16	
Paid River Improvement Fund for its portion of Sewerage Tax for July interest .....	106,792 55	
Paid Merchants' National Bank interest for carrying coupons.....	7,200 00	
Paid Merchants' Saving, Loan & Trust Company interest for carrying coupons.....	5,850 00	
Paid interest on old certificates of indebtedness.....	2,800 00	
Remittance to American Exchange Nat'l Bank for balance of July, 1878, interest.....	1,398 49	
Commissions for paying interest coupons.....	301 26	
Premium on bonds purchased.....	204 00	
	<hr/>	<hr/>
Total expenditure..	\$285,584 52	\$277,185 47

## SEWERAGE SINKING FUND.

Statement of Receipts and Expenditures of Sewerage Sinking Fund from January 1, 1878, to December 31, 1878 :

## RECEIPTS.

Proceeds sale of six Water Bonds..	\$6,402 00	
Amount of appropriation for 1878..	500 00	
	<hr/>	
Total receipts.....		\$6,902 00

## EXPENDITURES.

For six Water Bonds, purchased as an investment.....	\$6,150 00	
For fourteen Sewerage Bonds pur- chased and canceled.....	14,482 50	
	<hr/>	
Total expenditures.....		\$20,632 50

## SEWERAGE TAX FUND.

Statement of Receipts by the Department of Public Works, and detailed statement of Expenditures from January 1, 1878, to December 31, 1878, inclusive :

## RECEIPTS.

Amount of Appropriation by City Council.....	\$75,000 00	
Received from the North Chicago City Railroad for constructing sewer.....	4,886 22	
Received from the West Chicago City Railroad for constructing sewer.....	1,850 00	
	<hr/>	
Amount carried forward.....	\$81,736 22	

Amount brought forward.....	\$81,736 22	
Received from the Chicago, Milwaukee & St. Paul Railroad for constructing sewer.....	700 10	
Received from J. O'Callaghan for constructing sewer.....	640 20	
Received from contract forfeit.....	200 00	
Received from covers sold.....	123 45	
Received from labor.....	9 75	
	<hr/>	
Total receipts.....		\$83,409 72

## EXPENDITURES.

## WARD I.

	Cash Payments.	True Cost.
Brick used.....	\$54 00	
Covers used.....	33 81	
Pipe used.....	82 05	
Cement used.....	31 20	
Transferred from Miscellaneous Expense.....	36 50	
Transferred from Ward 4	98 20	
	<hr/>	
		\$335 76

## WARD 3.

Labor constructing sewer .....	\$751 10		
Driving piles.....	334 50		
Brick.....	21 93		
Cement.....	2 21		
Hardware .....	6 00		
Bolts.....	3 35		
	<hr/>		
		\$1,119 09	
ADD—			
For covers used.....	4 83		
For pipe used.. .....	4 00		
	<hr/>		
Amount carried forward	\$8 83	\$1,119 09	\$335 76

		Cash Payments.	True Cost.
Amount brought forward	\$8 83	\$1,119 09	\$335 76
For transfer from Miscellaneous Expense. .	49 50		
For transfer from Ward 4 Expense.....	15 85		
	<u>\$74 18</u>		

## DEDUCT—

Amount transferred to Brick account.....	17 13		
	<u>\$57 05</u>		1,176 14

## WARD 4.

Constructing sewers.....	\$17,445 28		
Labor .....	3,373 38		
Brick .....	3,474 77		
Cement.....	2,333 29		
	<u>26,626 72</u>		

## ADD—

For covers used.....	\$844 38		
For pipe used.....	2,112 25		
For cement used.....	214 86		
For transfer from Miscellaneous Expense....	1,314 00		
For advances paid in 1878	280 00		
	<u>\$4,765 49</u>		

## DEDUCT—

Amount transferred to sundry Wards.....	547 78		
	<u>\$4,217 71</u>		30,844 43
Amount carried forward.		<u>\$27,745 81</u>	<u>\$32,356 33</u>



	Cash Payments.	True Cost
Amount brought forward	\$27,745 81	\$32,356 33

## WARD 5.

Constructing sewers.....	\$4,413 19
Labor.....	2,327 37
Brick .....	3,061 71
Cement.....	1,099 19
Plumbing.....	184 85
Covers.....	42 00
Filling.....	7 02

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11,135 33

## ADD—

For sewer constructed by private parties.....	\$627 70
For covers used.....	854 03
For pipe used.....	3,461 86
For cement used.....	207 05
For transferred from Ward Accounts.....	190 13
For transferred from Mis- cellaneous Expense...	715 50
For 15 per cent. reserved on Clarkson's contract.	36 92

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\$6,093 19

## DEDUCT—

Amount received for con- structing sewer.....	\$640 20
Amount transferred to Brick Account.....	393 23
Amount of advance of J. O'Callaghan trans- ferred.....	627 70

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\$1,661 13

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\$4,432 06

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\$15,567 39

Amount carried forward.

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\$38,881 14

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\$47,923 72

	Cash Payments	True Cost
Amount brought forward	\$38,881 14	\$47,923 72

## WARD 6.

Constructing sewers.....	\$10,385 35	
Cement used.....	3,232 75	
Brick used.....	7,773 10	
Sand .....	375 20	
Filling.....	538 35	
Plumbing .....	130 40	
Iron work.....	11 20	
Powder .....	27 10	
Stone .....	6 30	
	<hr/>	22,479 75

## ADD—

For covers used.....	\$443 90
For pipe used.....	874 38
For cement used.....	629 20
For transfer from Miscellaneous Expense.....	1,080 00
From amount transferred to P. D. Bitricher.....	6,861 30
	<hr/>
	\$9,888 78

## DEDUCT—

Amount transferred from Brick Account.....	\$496 27	
Amount transferred from Ward 5.....	148 90	
Amount transferred to P. D. Bitticher.....	7,209 06	
	<hr/>	
	\$7,854 23	
	<hr/>	
	\$2,034 55	
	<hr/>	
Amount carried forward.	\$61,360 89	\$24,514 30
		<hr/>
		\$72,438 02

	Cash Payments.	True Cost.
Amount brought forward	\$61,360 89	\$72,438 02

## WARD 7.

Constructing sewers.....	\$1,328 93	
Filling.....	163 78	
Brick .....	128 00	
Cement .....	65 19	
Plumbing.....	168 35	
	<hr/>	1,854 25

## ADD—

For covers used.....	\$168 87	
For pipe used.. .....	1,953 58	
For cement used.....	45 61	
For transfer from Miscel- laneous Expense.....	180 00	
For transfer from Ward 11 .....	102 53	
	<hr/>	\$2,450 59

## DEDUCT—

Amount transferred to Brick Account.....	\$10 40	
Amount transferred from Ward 8.....	168 01	
	<hr/>	
	178 41	
	<hr/>	
	2,272 18	4,126 43

## WARD 8.

Constructing sewer.....	\$715 12	
Brick used.....	568 46	
Cement used.....	141 44	
	<hr/>	1,425 02
Amount carried forward	<hr/>	<hr/>
	\$64,640 16	\$76,564 45

		Cash Payments.	True Cost.
Amount brought forward		\$64,640 16	\$76,564 45
ADD—			
For covers used.....	33 77		
For pipe used.....	48 62		
For transfer from Miscellaneous Expense.....	38 00		
For transfer from Ward 7	168 01		
	<u>\$288 40</u>		
DEDUCT—			
Amount charged Brick Account.....	\$513 90		
Cement charged in error.	116 74		
Transfer to Ward 11....	261 00		
	<u>891 64</u>		
	\$603 24		821 78
WARD 9.			
For brick used.....	\$6 00		
For covers used.....	4 83		
For pipe used.....	4 00		
For cement used.....	3 90		
For transfer from Miscellaneous Expense.....	22 50		
	<u>41 23</u>		
WARD 10.			
For brick used.....	\$24 00		
For covers used.....	14 49		
For pipe used.....	41 29		
For cement used.....	14 30		
For transfer from Miscellaneous Expense.....	60 50		
	<u>154 58</u>		
Amount carried forward		\$64,640 16	\$77,582 04

	Cash Payments.	True Cost
Amount brought forward	\$64,640 16	\$77,582 04

## WARD 11.

Constructing sewer.....	\$1,928 86	
Brick .....	560 99	
Cement.....	295 03	
Plumbing .....	39 20	
Filling.....	36 89	
	<hr/>	2,860 97

## ADD—

Transfer from Ward 12.	412 24	
For brick used.....	434 02	
For covers used.....	193 00	
For pipe used. ....	294 61	
For cement used.....	179 57	
For transfer from Miscellaneous Expense.....	180 00	
For transfer from Ward 8	261 00	
For 15 per cent. reserved on Scanlon's contract	92 11	
For advances refunded in 1878.....	1,040 11	
	<hr/>	
	\$3,086 66	

## DEDUCT--

Amount transferred from Ward 12.....	\$824 48	
Amount transferred from Ward 7.....	102 53	
	<hr/>	
	\$927 01	
	<hr/>	
	\$2,159 65	

\$5,020 62

## WARD 12.

Constructing sewer.....	\$9,343 52	
Brick.....	4,845 27	
	<hr/>	

Amount carried forward	\$14,188 79	\$67,501 13	\$82,602 66
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		Cash Payments.	True Cost.
Amount brought forward	\$14,188 79	\$67,501 13	\$82,602 66
Cement.....	2,102 89		
Plumbing.....	339 47		
Filling.....	90 00		
	<hr/>	16,721 15	

## ADD--

For brick used.....	\$310 22
For covers used.....	1,071 31
For pipe used.....	3,729 47
For cement used.....	219 16
For transfer from Miscellaneous Expense.....	1,006 50
For transfer from Ward 13 .....	219 05
For transfer from Ward 11 .....	824 48
For 15 per cent, reserved on McNichols' contract	41 70
For advances paid in 1878	2,748 16
	<hr/>
	10,170 05

## DEDUCT--

Amount transferred from Ward 11 .....	\$412 24
Amount received from N. D. R. R. Co.....	1,850 00
	<hr/>
	2,262 24
	<hr/>
	\$7,907 81

24,628 96

## WARD 13.

Constructing sewer.....	\$1,834 01
Brick.....	224 52
Cement .....	70 54
Plumbing... ..	16 65
	<hr/>

2,145 72

Amount carried forward

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\$86,368 00

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\$107,231 62

	Cash Payments.	True Cost.
Amount brought forward	\$86,368 00	\$107,231 62

## ADD—

For sewer constructed by C. M. & St. P. R. R..	700 10
For covers used.....	140 07
For pipe used.....	680 72
For cement used.....	45 46
For transfer from Miscel- laneous Expense.....	166 50
For 15 per cent. on Mc- Nichols' contract.....	104 32
	<hr/>
	\$1,837 17

## DEDUCT—

Amount received for con- structing sewer.....	\$700 10
Amount transferred to Brick Account.....	25 60
Amount transferred to Ward 18.....	29 60
Amount transferred to Ward 12.....	219 05
Amount transferred from Sewerage Advances..	700 10
	<hr/>
	1,674 45
	<hr/>
	162 72

2,308 44

## WARD 14.

Constructing sewers.....	\$12,658 64
Brick.....	4,550 57
Cement.....	1,962 96
Filling.....	18 24
Plumbing.....	78 75
	<hr/>

19,269 16

Amount carried forward

\$105,637 16	\$109,540 06
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	Cash Payments.	True Cost.
Amount brought forward	\$105,637 16	\$109,540 06
ADD—		
For covers used.....	\$858 85	
For pipe used.....	1,878 72	
For cement used.....	189 99	
For transfer from Miscellaneous Expenses....	935 96	
	<u>\$3,863 52</u>	
DEDUCT—		
Amount transferred to Brick Account.....	24 89	
	<u>\$3,838 63</u>	
		23,107 79

## WARD 15.

Constructing sewer.....	\$8,753 46		
Brick.....	2,634 37		
Cement.....	819 25		
Plumbing .....	1 25		
	<u>12,208 33</u>		
ADD—			
For sewer constructed by N. C. C. R. R.....	\$4,656 97		
For covers used.... ..	521 10		
For pipe used.....	2,196 63		
For transfer from Miscellaneous Expense.....	819 00		
For 15 per cent. reserved on M. Hallman's contract .....	20 53		
For advances paid in 1878	752 00		
	<u>\$8,966 23</u>		
Amount carried forward	<u>\$117,845 49</u>	<u>\$132,647 85</u>	



	Cash Payments.	True Cost.
Amount brought forward	\$117,845 49	\$132,647 85
DEDUCT—		
Amount received for constructing sewer.....	\$4,886 22	
Amount transferred from Brick Account.....	1,203 61	
Amount transferred from Cement Account.....	40 55	
Amount transferred to Sewerage Advances..	4,656 97	
	<u>\$10,787 35</u>	
	1,821 12	10,387 21

## WARD 16.

Constructing sewer.....	\$959 56	
Cement.....	73 07	
Brick.....	84 50	
	<u>\$1,117 13</u>	

## ADD—

For brick used .....	\$65 35	
For covers used.....	72 38	
For pipe used.....	427 46	
For cement used.....	8 83	
For transfer from Miscellaneous Expense.....	72 00	
	<u>\$646 02</u>	1,763 15

## WARD 17.

Labor .....	40 20	
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## ADD—

For transfer from Miscellaneous expense.....	\$2 00	42 20
Amount carried forward.	<u>\$119,002 82</u>	<u>\$144,840 41</u>

	Cash Payments.	True Cost.
Amount brought forward	\$119,002 82	\$144,840 41

## WARD 18.

For bricks used.....	\$6 00	
For covers used.....	4 83	
For pipe used .....	19 25	
For cement used.....	5 20	
For transfer from miscel- laneous expense.....	2 00	
For transfer from Ward 13 .....	29 60	
	<hr/>	
	\$66 88	\$66 88

SEWERAGE, MISCELLANEOUS  
EXPENSE.

Labor .....	\$2,941 71	
Salary of Engineers ....	3,128 33	
Brick.....	738 48	
Sand .....	356 25	
Salary of Draughtsman.	300 00	
Cement.....	41 75	
Printing .....	53 67	
	<hr/>	
	\$7,560 19	

## DEDUCT—

Amount received for labor.....	\$9 75	
Amount transferred to brick account.....	738 48	
Amount transferred to cement account.....	37 50	
Amount transferred to ward accounts.....	6,680 46	
	<hr/>	
	\$7,466 19	\$94 00
	<hr/>	<hr/>
Amount carried forward	\$126,563 01	\$145,001 29

	Cash Payments.	True Cost
Amount brought forward	\$126,563 01	\$145,001 29

## SEWERAGE COVERS.

Lumber.....	\$3,197 47	
Labor.....	2,177 07	
Nails .....	428 45	
	<u>          </u>	\$5,802 99

## DEDUCT—

Amount received for covers sold.....	\$123 45	
Amount charged ward accounts.....	5,264 45	
	<u>          </u>	
	\$5 387 90	\$415 09

## SEWERAGE PIPE.

Pipe purchased.....	\$28,825 50	
Labor .....	847 11	
	<u>          </u>	\$29,672 61

## DEDUCT—

Amount charged ward accounts.....	\$17,808 89	\$11,863 72
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## BRICK ACCOUNT.

Labor .....	\$257 23
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## ADD—

For bricks transferred from ward accounts..	\$3,816 01
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## DEDUCT—

Amount charged ward accounts .....	899 59	
	<u>          </u>	
	\$2,916 42	\$3,173 65
	<u>          </u>	
Amount carried forward	\$162,295 84	\$160,453 75

	Cash Payments.	True Cost.
Amount brought forward	\$162,295 84	\$160,453 75
SUNDRY SEWERS		
Paid N. C. H. R. R. Co. for advance on Larra- bee street.....	\$752 00	
Paid N. DeGolyer for advance on Indiana avenue.....	280 00	
Paid E. Gaylord for ad- vance on Calumet ave- nue.....	730 50	
Paid D. Lam for advance on Polk street.....	471 33	
Paid S. W. Rawson for advance on Grimshaw street .....	629 30	
	<hr/>	\$2,863 13
DEDUCT—		
Amount transferred to ward accounts.....	\$2,863 13	
	<hr/>	<hr/>
Amount of expenditures	\$165,158 97	\$160,453 75

## DEPARTMENT OF PUBLIC WORKS' APPROPRIATION FUND.

Statement of Receipts by the Department of Public Works from January 1st, 1878, to December 31st, 1878, inclusive, and detailed statement of Expenditures during the same time.

### RECEIPTS.

Amount of appropriation by Common Council.....	\$498,714 22	
Amount received from special warrants.....	41,236 37	
Amount received from special warrants, cost of proceedings..	13,468 23	
Amount received from Cook County, rent City Hall.....	4,500 00	
Amount received from Cook County, heating City Hall....	1,399 26	
Amount received for repaving..	1,011 37	
Amount received for keeping State street viaduct in repairs..	400 00	
Amount received for permits issued .....	67 40	
Amount received for broken lamps and posts.....	77 25	
Amount received for damage to bridges .....	90 70	
Amount received for scrap iron sold.....	43 74	
Total receipts.....		\$561,008 54

## EXPENDITURES.

## NORTH DIVISION.

		Cash Payments.	True Cost.
Sweeping improved streets .....	\$516 70		
Labor, cleaning and repairing streets..... ..	21,658 11		
Paving blocks.....	1,931 72		
Lumber .....	756 14		
Cinders.....	350 00		
Nails.....	119 50		
Gravel .....	155 00		
Hardware .....	60 11		
Advertising .....	42 60		
Rent of lumber lot .....	25 00		
Horse keeping.....	32 25		
	<hr/>	\$25,647 13	

## DEDUCT—

Amount received for repaving .....	\$187 20	\$25,459 93
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## SOUTH DIVISION.

Sweeping improved streets.....	\$1,436 18		
Labor, cleaning and repairing streets.....	30,374 10		
Repairing Wabash avenue .....	3,693 57		
Repaving Prairie avenue	3,854 04		
Paving blocks.....	2,802 16		
Lumber .....	1,714 38		
Hardware.....	271 13		
Iron work, repairing tools .....	221 70		
	<hr/>	<hr/>	<hr/>
Amount carried forward.	\$44,367 26	\$25,647 13	\$25,459 93

THE DEPARTMENT OF PUBLIC WORKS.

181

		Cash Payments.	True Cost
Amount brought forward	\$44,367 26	\$25,647 13	\$25,459 93
Stone and spalls.....	118 00		
Cinders.....	185 72		
Nails .....	285 17		
Keeping horse.....	92 50		
Gravel.....	56 00		
		\$45,104 65	

DEDUCT—

Amount received for re-			
paving.....	\$324 62		\$44,780 03

WEST DIVISION.

Sweeping improved			
streets.....	\$871 97		
Labor, cleaning and re-			
pairing streets.....	56,179 13		
Lumber.....	4,503 78		
Paving blocks.....	2,620 03		
Repairing tools.....	286 82		
Nails.....	365 75		
Stone spalls.....	538 00		
Macadam.....	233 58		
Cinders.....	200 00		
Hardware .....	125 92		
Paving cement.....	109 50		
Advertising .....	48 89		
Cement.....	6 85		
Horse keeping.....	70 00		
Rent of lot for lumber..	25 00		
Plumbing .....	26 27		
Sand .....	7 00		
Gravel.....	27 00		
One plow .....	17 00		
		\$66,262 49	
Amount carried forward		\$137,014 27	\$70,239 96

		Cash Payments.	True Cost.
Amount brought forward		\$137,014 27	\$70,239 96
DEDUCT—			
Amount received for re-			
paving.....	\$499 55		\$65,762 94
SIDEWALKS, NORTH			
DIVISION.			
Salary of Inspector.....	\$982 30		
Constructing walks.....	48 76		
	<hr/>	\$1,031 06	\$1,031 06
SIDEWALKS, SOUTH			
DIVISION.			
Salary of Inspectors.....	\$916 66		
Constructing walks.....	183 81		
	<hr/>	\$1,100 47	\$1,100 47
SIDEWALKS, WEST			
DIVISION.			
Salary of Inspector.....	\$1,800 00		
Constructing walk.....	141 49		
Advertising.....	9 05		
	<hr/>	\$1,950 54	\$1,950 54
SPECIAL ASSESSMENT			
EXPENSE.			
Court costs, Commission-			
ers and witness fees...	\$5,709 50		
Expense collecting taxes.	2,663 76		
Advertising.....	1,880 92		
Scrap iron credited this			
acct. in error refunded.	287 07		
Salary of Asst. Engineer	480 00		
	<hr/>		
Amount carried forward	\$11,021 25	\$141,096 34	\$140,084 97



		Cash Payments.	True Cost.
Amount brought forward	\$11,021 25	\$141,096 34	\$140,084 97
Salary of Clerks.....	225 00		
Salary of Rodman.....	112 50		
Postage stamps.....	150 00		
Stationery .....	41 00		
Printing .....	68 50		
Hardware.....	3 00		
	<hr/>	\$11,621 25	

## DEDUCT—

Amount received from  
Special Assessments.. \$13,468 23

## OFFICE EXPENSE.

½ salary of City Engineer	\$1,166 64		
½ salary of Secretary...	666 64		
½ salary of Bookkeeper.	733 32		
½ salary of Asst. do....	533 32		
½ salary of Superintend't	800 00		
Salary of Special Assessment Clerks.....	6,200 00		
Salary of Draughtsman.	1,964 61		
Salary of Rodman.....	805 00		
Advertising.....	321 74		
Engraving for report....	106 67		
Printing.....	365 05		
Printing Second Annual Report .....	515 27		
Cash items paid by Cashier.....	410 98		
Stationery.....	322 13		
Subscription to daily papers.....	10 00		
Toweling .....	8 75		
Repairing instruments.,	19 95		
Soap.....	5 00		
Dusters.....	20 00		
	<hr/>	\$14,975 07	\$14,975 07
Amount carried forward		\$167,692 66	\$155,060 04

	Cash Payments	True Cost
Amount brought forward	\$167,692 66	\$155,060 04

OLD CITY HALL.

Salary of Engineer and Fireman.....	\$1,800 00
Salary of Janitors and Watchman.....	2,340 00
Repairing building.....	1,613 40
Coal used.....	1,745 13
Gas used.....	908 94
New smoke stack.....	180 00
Lumber.....	347 57
Painting and calcimining	204 51
Hardware.....	125 98
Sprinkling around City Hall.....	129 00
Wire rail.....	111 95
Plumbing.....	38 10
Cleaning vault.....	10 00
Steam fitting.....	88 88
Matches .....	29 25
Pails.....	18 08
Soap.....	36 15
Brooms and brushes....	27 05
Awnings.....	15 50
Plastering.....	91 34
Locks and keys.....	36 50
Compound for boiler....	7 50

\$9,904 83

DEDUCT--

Amount received from Cook County for heat- ing.....	1,399 26
Amount received from Cook County for rent.	4,500 00
	<u>\$5,899 26</u>

\$4,005 57

Amount carried forward.	\$177,597 49	\$159,065 61
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	Cash Payments.	True Cost.
Amount brought forward	\$177,597 49	\$159,065 61

WASHINGTON PARK.

Salary of Superintend't..	483 30	483 30
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ELLIS PARK.

Labor .....	\$480 00	
Trees .....	187 50	
Filling.....	23 50	
Hardware.....	10 25	
	<hr/>	
	701 25	701 25

LAKE PARK.

Labor .....	\$1,389 18	
Coal.....	4 75	
Trees .....	48 00	
Tools .....	2 35	
One mower.....	22 00	
One mower.....	16 50	
Repairing mowers.....	11 98	
Sprinkling.....	50 00	
	<hr/>	
	\$1,544 76	\$1,544 76

UNION PARK.

Labor .....	\$1,115 56	
Food for animals.....	296 94	
Sewer work.....	57 60	
Cement.....	2 50	
Coal.....	9 50	
Hardware.....	2 10	
	<hr/>	
	\$1,484 20	\$1,484 20

JEFFERSON PARK.

Labor :.....	\$697 50	
Feed for fowls.....	38 03	
Cement.....	14 50	
Coal .....	4 75	
	<hr/>	
	754 78	754 78
	<hr/>	
Amount carried forward.....	\$182,565 78	\$164,033 90

	Cash Payments.	True Cost
Amount brought forward	\$182,565 78	\$164,033 90

## VERNON PARK.

Labor .....	\$860 50		
Repairing mower .....	4 00		
	<hr/>	864 50	864 50

## WICKER PARK.

Labor .....		667 12	667 12
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## WASHINGTON STREET

## TUNNEL.

Salary of Engineer .....	900 00		
Labor .....	92 90		
Cleaning tunnel .....	320 00		
Castings .....	148 36		
New pump .....	200 00		
Cement .....	202 55		
Paving cement .....	70 00		
Gravel .....	37 50		
Coal .....	73 40		
Repairing engine .....	41 55		
Alcohol .....	22 65		
Repairing lamps .....	19 00		
Iron work .....	24 10		
Hardware .....	7 50		
Lumber .....	2 88		
Advertising .....	7 20		
Cement .....	1 50		
	<hr/>	2,171 09	2,171 09

## LA SALLE STREET

## TUNNEL.

Salary of Engineer. ....	900 00		
Labor .....	98 10		
Cleaning tunnel .....	270 00		
	<hr/>		
Amount carried forward	\$1,268 10	\$186,268 49	\$167,736 61

THE DEPARTMENT OF PUBLIC WORKS.

187

		Cash Payments.	True Cost
Amount brought forward	\$1,268 10	\$186,268 49	\$167,736 61
Alcohol.....	30 90		
Coal.....	46 80		
Waste.....	4 10		
Hardware.....	8 39		
Brooms.....	3 38		
Advertising.....	7 20		
	<hr/>	1,368 87	1,368 87

PUBLIC BENEFITS.

Improving City's portion of streets that were newly paved.....	93,271 19		
Salary of Inspectors....	3,533 12		
Improving alleys.....	398 85		
Building return wall....	168 11		
Advertising.....	80 40		
	<hr/>	97,451 67	97,451 67

CHICAGO HARBOR.

Salary of Harbor Mas- ters.....	1,800 00		
Labor.....	593 59		
Building Docks.....	183 75		
Use tug.....	112 00		
Lumber.....	50 00		
Rope and blocks.....	33 61		
Hardware.....	2 75		
	<hr/>	2,775 70	2,775 70

STREET LAMPS.

Labor repairing lamps..	726 00		
Glass.....	636 94		
New lamps.....	201 75		
Repairing lamps.....	206 04		
	<hr/>		
Amount carried forward	\$1,770 73	\$287,864 73	\$269,332 85

		Cash Payments.	True Cost.
Amount brought forward	\$1,770 73	\$287,864 73	\$269,332 85
Keeping horse.....	19 50		
Tips.....	38 00		
Advertising.....	11 32		
	<hr/>	1,839 55	

## DEDUCT—

Amount received for broken lamps.....	77 25		1,762 30
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## BRIDGE TENDERS'

## SALARIES.

Amount paid for tending bridges.....		38,670 00	38,670 00
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## BRIDGE DEPARTMENT.

Salary of Superintendent	1,500 00
Labor of Carpenters...	7,475 87
Lumber.....	5,999 98
Painting bridges.....	1,371 00
Iron work.....	586 47
Rent of lot.....	450 00
Coal.....	493 45
Drawing piles.....	470 80
Nails.....	368 50
Oil.....	327 95
Damage to vessels.....	209 98
Castings.....	196 57
Oars.....	20 00
Brooms.....	49 00
Barrows.....	11 00
Rope and oars.....	47 45
Signal ball.....	31 35
Hardware.....	59 68

Amount carried forward.	\$19,669 05	\$328,374 28	\$309,765 15
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## THE DEPARTMENT OF PUBLIC WORKS.

189

		Cash Payments.	True Cost.
Amount brought forward	\$19,669 05	\$328,374 28	\$309,765 15
Advertising.....	9 83		
Lanterns and repairs....	28 65		
Repairing clocks.....	14 00		
Repairing stoves.....	37 18		
Bills.....	64 88		
Masonry work.....	44 37		
	<hr/>	19,867 96	

## DEDUCT—

Amount received for re- pairing State street via- duct.....	400 00		
Amount received for damages.....	90 70		
Amount received for scrap iron.....	43 74		
	<hr/>		
	534 44		19,333 52

## FULLERTON AVENUE

## BRIDGE.

Paid J. W. Savin & Co, Estimate No. 1.....	1,955 00	1,955 00
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## NORTH AVENUE BRIDGE.

Paid Conro, Carlin & Co., Estimate No. 2..	2,899 00	2,899 00
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## STREET PERMITS.

Labor.....	<hr/>	1,431 23	1,431 23
Amount carried forward.		\$354,527 47	\$335,383 90

	Cash Payments.	True Cost.
Amount brought forward	\$354,527 47	\$335,383 90

## EIGHTEENTH STREET

## VIADUCT.

Paid for substructure...	\$10,403 43		
Paid Keystone Bridge Co	5,000 00		
Paid salary of Engineer.	1,125 00		
Labor of Inspectors....	517 50		
Advertising.....	76 23		
Repairing main.....	74 40		
	<hr/>	17,196 56	17,196 56

## MILWAUKEE AVENUE

## VIADUCT.

Paid for raising buildings	5,843 00	5,843 00
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## CLEANING NORTH

## BRANCH

Paid Fitzsimmons and Connell, in full.....	49,794 65		
Paid assistant engineer..	925 00		
Labor .....	44 00		
Hardware.....	4 80		
	<hr/>	50,768 45	50,768 45

## OGDEN DITCH DAM.

Carriage hire.....	28 00		
Boots.....	7 00		
	<hr/>	35 00	35 00

## CERTIFICATES OF

## INDEBTEDNESS.

Temporary loans paid...	<hr/>	7,000 00	7,000 00
Amount carried forward		\$435,370 48	\$416,226 91



	Cash Payments.	True Cost
Amount brought forward	\$435,370 48	\$416,226 91
INTEREST ON CERTIFICATES OF INDEBTEDNESS.		
Interest paid on temporary loans.....	3,330 83	3,330 83
Total expenditures.....	438,701 31	419,557 74

## RIVER IMPROVEMENT SINKING FUND.

## RECEIPTS.

Proceeds sale 6 water bonds.....	6,402 00	
Amount of appropriation for 1878 .....	500 00	
Total receipts.....		6,902 00

## EXPENDITURES.

	Cash Payments.	True Cost.
For 6 water bonds purchased.....	6,150 00	
For 5 river improvement bonds purchased and cancelled.....	5,387 50	
For 4 river improvement bonds purchased and cancelled.....	4,329 20	
For 1 river improvement bond purchased and cancelled.....	1,090 38	
	16,957 08	
DEDUCT—		
Amount received for 6 water bonds.....	6,402 00	10,555 08

## CITY HALL FUND.

## RECEIPTS.

Amount received from Canal Redemption Fund.....	\$136,481 24	
Amount of appropriation for 1878.....	<u>150,000 00</u>	
Total receipts.....		\$286,481 24

## EXPENDITURES.

		Cash Payments.	True Cost
Iron Cells.....	1,500 00		
Salary of Superintendent	4,275 23		
Painting iron work.....	572 30		
Laying drain.....	216 69		
Filling.....	488 80		
Coal Vault.....	288 03		
Lumber.....	529 73		
Hardware.....	112 00		
Traveling expenses.....	24 25		
Iron work.....	61 07		
Sewer permits.....	40 00		
Advertising.....	49 73		
Stationery.....	69 05		
Filling.....	21 72		
	<u>          </u>	8,248 80	8,248 80

## CONTRACTS.

Paid Mortimer & Tapper for foundation....	44,097 92	44,097 92
Paid P. J. Sexton for iron work. ....	25,553 67	25,553 67
Paid John Angus for brick work.....	18,355 69	18,355 69
Paid Thomlinson & Reed for cut stone work....	<u>61,315 26</u>	<u>61,315 26</u>
	157,571 34	157,571 34

## CITY BRIDEWELL FUND.

## EXPENDITURES.

		Cash Payments.	True Cost.
Lumber .....	\$3,194 09		
Stone .....	1,441 00		
Steam fitting.....	274 35		
Fire brick.....	211 75		
Advertising .....	19 87		
Hardware.....	126 77		
One boiler.....	37 20		
Nails.....	113 47		
Drill .....	31 50		
Sand .....	144 40		
Lime.....	347 88		
Lead.....	39 98		
Grates .....	4 00		
Sewer pipe.....	10 00		
Engineer.....	262 50		
Oil.....	40 54		
Iron.....	25 22		
Iron work.....	223 82		
Labor .....	97 75		
Roofing .....	277 00		
Rope.....	9 59		
Pipe .....	14 28		
One casting.....	1 14		
Total expenditures.....		\$6,948 10	\$6,948 10

## RECAPITULATION.

	Cash Payments.	True Cost.
Water fund brought forward.....	\$942,195 95	\$970,090 14
Sewerage fund brought forward..	285,584 52	277,185 47
Sewerage sinking fund brought forward .....	20,632 50	20,632 50
Sewerage tax fund brought for- ward.....	165,158 97	160,453 75
Appropriation fund brought for- ward.....	438,701 31	419,557 74
River improvement sinking fund brought forward.....	16,957 08	10,558 08
City hall fund brought forward....	157,571 34	157,571 34
City Bridewell fund brought for- ward.....	6,948 10	6,948 10
Total expenditures.....	<u>\$2,033 749 77</u>	<u>\$2,022,997 12</u>

Respectfully submitted,

E. M. JOHNSON,

*Chief Accountant Department of Public Works.*



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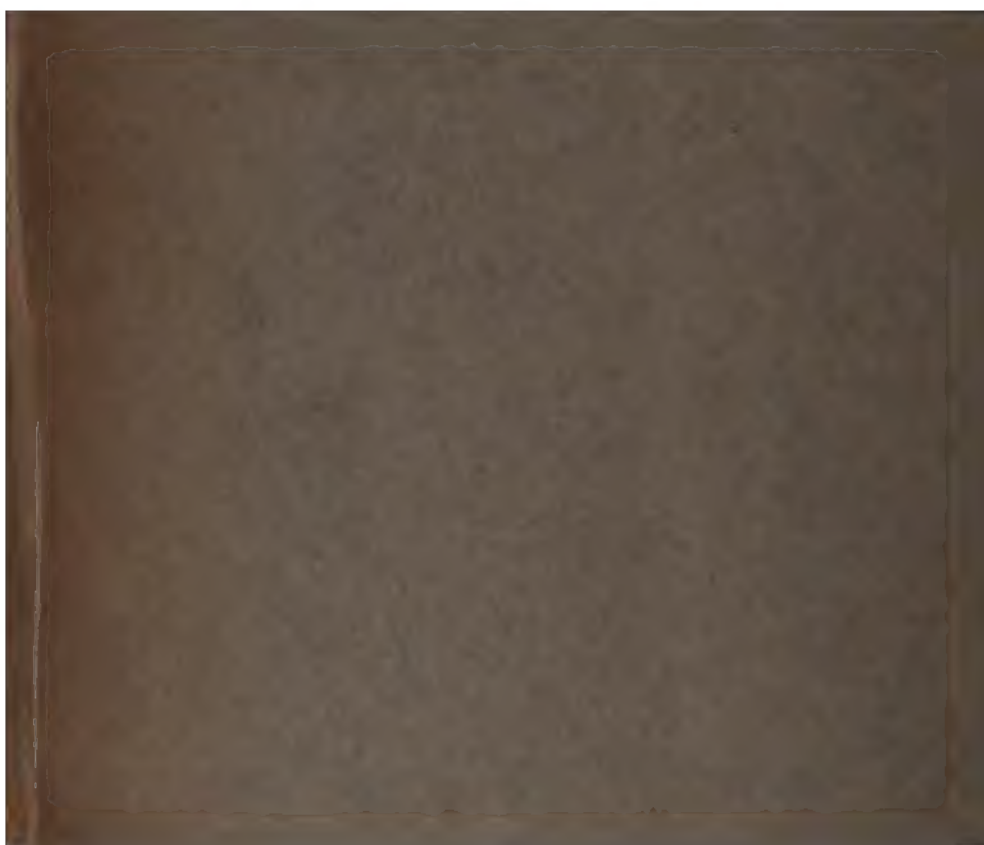












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